CATALOGUE

OF

KEUFFEL & ESSER CO.

NEW YORK

BRANCHES:

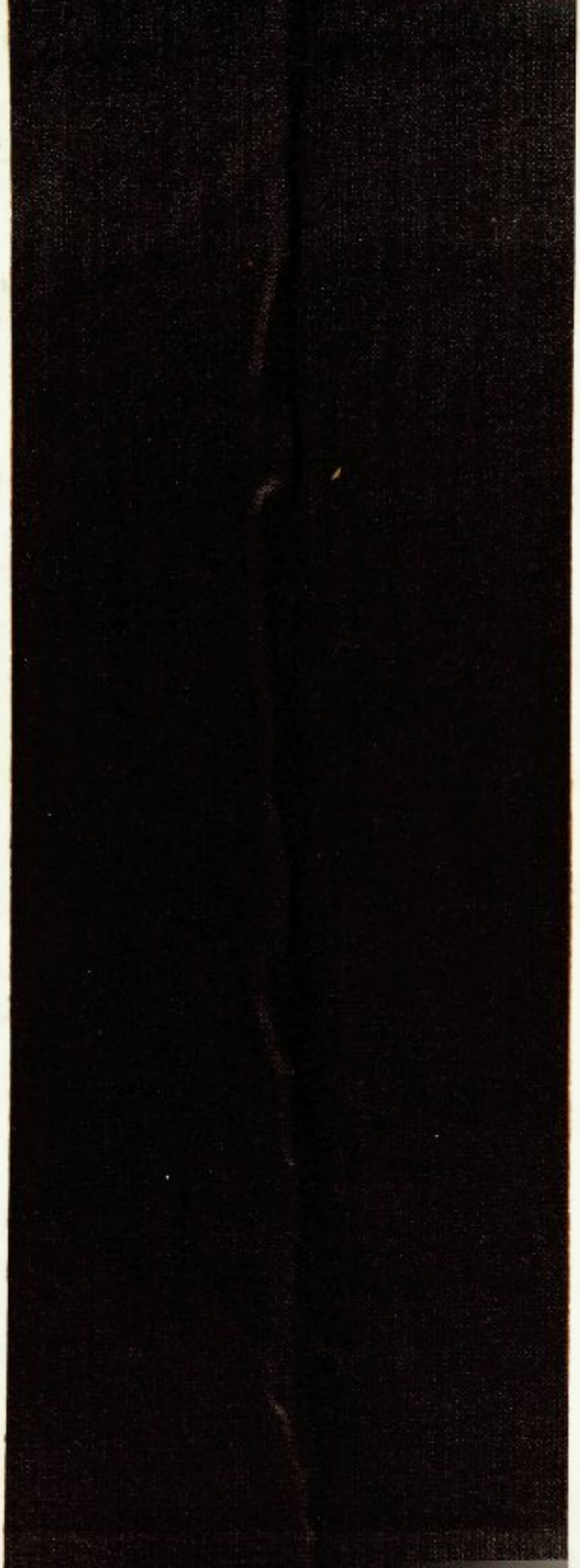
CHICAGO.

ST. LOUIS.

SAN FRANCISCO.

MONTREAL.

1909.



PRESS OF ROTHACKER & SCHWEIZER
61-71 GREENWICH AVE., NEW YORK

PITTSBURGH, PA.

HIGHEST AWARD GOLD MEDAL, PORTLAND, 1905



CATALOGUE
OF
KEUFFEL & ESSER CO.

MANUFACTURERS AND IMPORTERS

DRAWING MATERIALS
SURVEYING INSTRUMENTS



NEW YORK
127 FULTON STREET. 42 ANN STREET.
GENERAL OFFICE AND FACTORIES, HOBOKEN, N. J.
BRANCHES:
CHICAGO: 111 EAST MADISON ST.
ST. LOUIS: 813 LOCUST ST.
SAN FRANCISCO: 48-50 SECOND ST.
MONTREAL: 252 NOTRE DAME ST. WEST









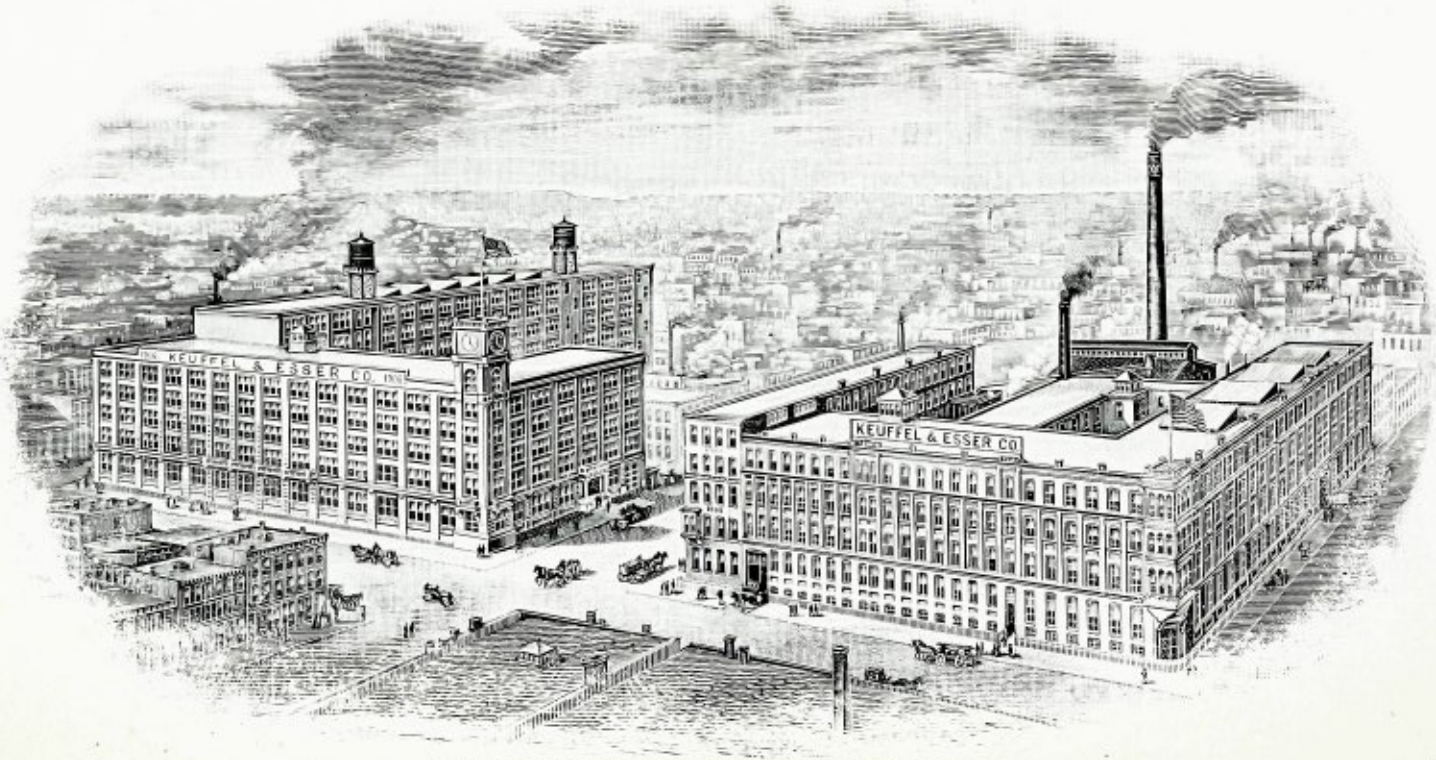
1909
33. EDITION

SPECIAL NOTICE.

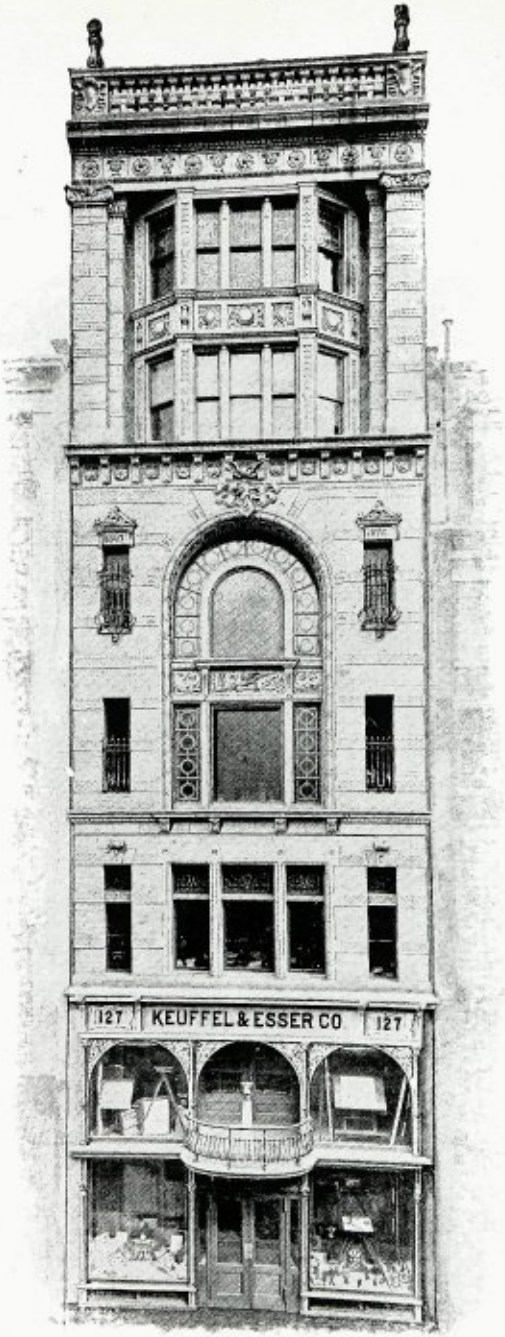
WE beg to call attention to it, that we have copyrighted this entire book and have also copyrighted separately about four hundred of the illustrations contained in it, and much of the descriptive and explanatory matter, although the general copyright of the book covers all of its contents. We have done this at considerable expense, in the interest of our patrons, to protect them against those dealers who claim to be manufacturers and copy our cuts and descriptions to create the impression that their goods, mostly bought in the cheapest market, are the same as the special grades and patterns **which we manufacture or control.**

Our goods always bear either one of our two general trade marks ( , K & E) or our name. Goods not bearing these marks are not our goods as listed in this catalogue

Copyright 1887 by KEUFFEL & ESSER.
Copyright 1890, 1891, 1892, 1893, 1894, 1895, 1897, 1898, 1899, 1902, 1905, 1909 by KEUFFEL & ESSER CO.



GENERAL OFFICE AND FACTORIES, HOBOKEN, N. J.
Completed 1907.

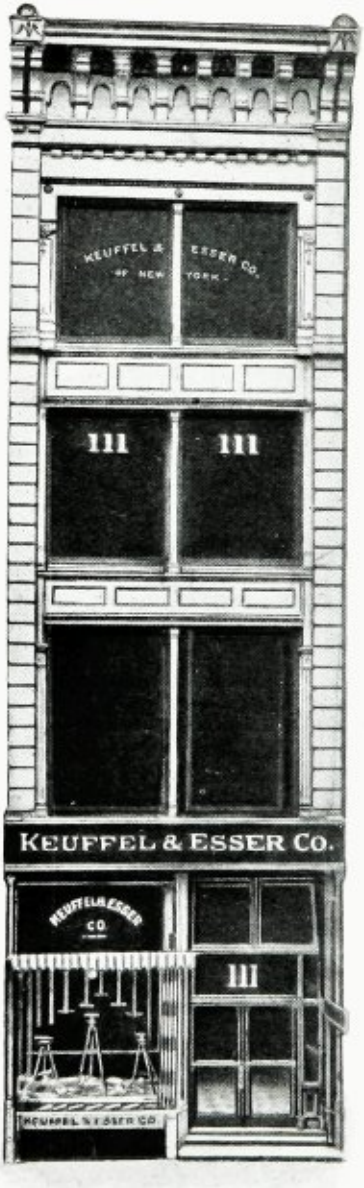


PARENT HOUSE, NEW YORK,
127 FULTON STREET, EXTENDING TO 42 ANN STREET.

KEUFFEL & ESSER CO. NEW YORK.



RETAIL DEPARTMENT, NEW YORK. (127 FULTON STREET.)



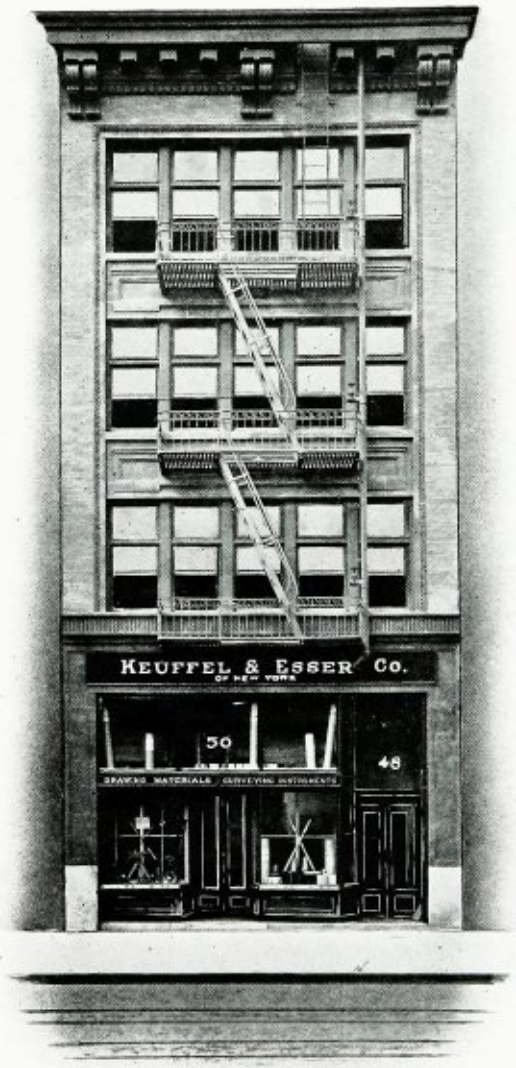
CHICAGO BRANCH, 111 East Madison Street.

ESTABLISHED 1891.



ST. LOUIS BRANCH, 813 Locust Street.

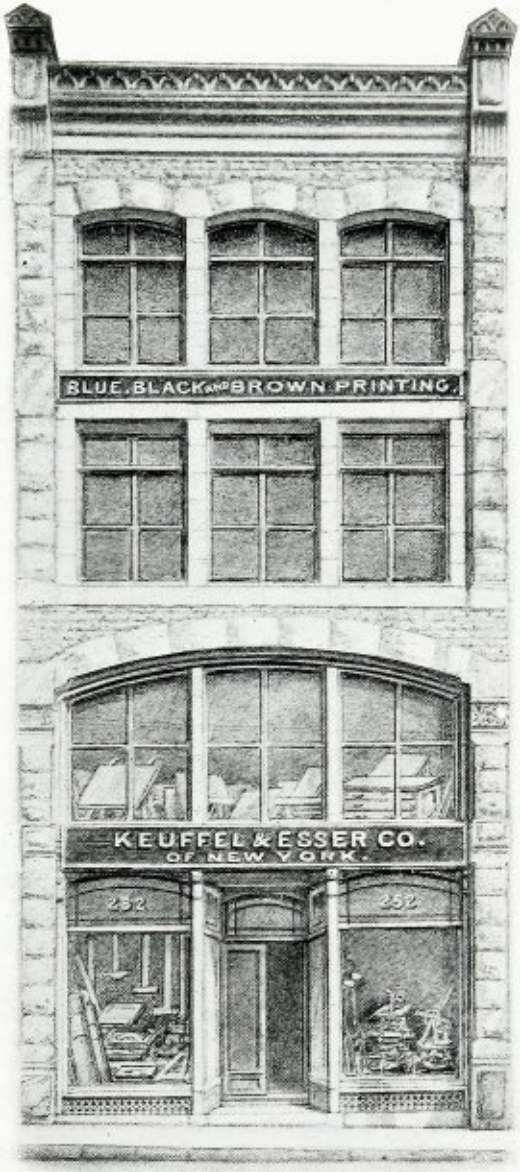
ESTABLISHED 1894.



SAN FRANCISCO BRANCH,

48-50 Second Street.

ESTABLISHED 1901.



MONTREAL BRANCH,

(Canada.)

252 Notre Dame Street West.

ESTABLISHED 1908.



KEUFFEL & ESSER CO. NEW YORK.

General Office Building, Hoboken, N. J.
COUNTING ROOM.

KEUFFEL & ESSER CO. NEW YORK.



General Office Building, Hoboken, N. J.
PACKING ROOM. SHIPPING DEPARTMENT.



General Office Building, Hoboken, N. J.

STOCK ROOM. SURVEYING INSTRUMENTS, DRAWING INSTRUMENTS AND MATERIAL.



General Office Building, Hoboken, N. J.
STOCK ROOM. PAPERS AND WOODEN GOODS.



KEUFFEL & ESSER CO. NEW YORK.

General Office Building, Hoboken, N. J.
STOCK ROOM. DRAFTING ROOM FURNITURE.

January, 1909.

To Our Patrons:

In submitting this, the 33rd edition of our catalogue, we bespeak for it the same kind reception which has been accorded the preceding editions.

This new catalogue continues the record of the history of our House, and of its progress, not only in the development of its organization and its facilities, but also in the improvement of those of our products which permitted of it. New goods have been added, either to increase the selection or to replace those which had become obsolete.

As our former headquarters at the **Parent House**, 127 Fulton St., New York, could no longer be made to afford sufficient room for our requirements, we have transferred to our Hoboken establishment the **Executive and General Offices**, Wholesale Ware Rooms, Shipping Department, Purchasing Department, etc., and the Export Department, which latter has also a representative at our New York house. The illustrations distributed through the catalogue show our new General Office and Factory buildings at Hoboken, N. J., which we have occupied since July 19, 1907, and which almost double our previous facilities for handling business.

Our **New York** establishment now includes the Retail, City Order and Blueprint Departments, which occupy the entire building, thus enabling us to display our goods in the most advantageous manner, and most convenient to our patrons.

To our Branches at **Chicago**, **St. Louis**, and **San Francisco** at which latter City we now occupy our new building Nos. 48-50 Second Street, we have added another at **Montreal**, Canada, 252 Notre Dame Street, West. We hope that our friends in Canada will appreciate our efforts to provide them with better facilities for obtaining our goods without substitution or the delay caused by Custom-House formalities.

All our Branches are equipped with a modern plant for preparing Blueprint and Blackprint papers, so that the stock obtained from them is always fresh and orders can be filled immediately.

Conscious of the standing which more than 40 years of progress and success have given our House, we shall make it our foremost duty to maintain our reputation for the absolute reliability of our goods as well as for strictest fairness and broad good will in our dealings with those who favor us with their patronage.

Very respectfully,

KEUFFEL & ESSER CO.

Besides this General Catalogue, we publish separately

CATALOGUE OF NAUTICAL INSTRUMENTS,

TRADE PRICE LIST, SUPPLEMENTAL TO THE GENERAL CATALOGUE,

(Instruments for schools, trade grades of drawing tools, etc.,)

TRADE PRICE LIST OF MEASURING TAPES (for the hardware trade.)

NOTICE.

THIS 33rd edition of our catalogue supersedes all previous editions

The prices in this Catalogue are Net Cash in New York, Chicago, St. Louis or San Francisco* and are subject to change without notice. For our Branch at Montreal, Canada, we issue a separate pricelist.

In ordering by this Catalogue it is necessary to give the number with the price of the article and in some cases the sub-number, size, color, etc.

Remittances can be made either by bank-draft payable to our order, by Cash sent through any of the Express Companies, or by Post-Office or Express Money-Order. If Cash is sent by mail, the letter should be registered.

Remittances are in all cases at the risk of the sender.

New accounts can be opened only with firms rated in the commercial reference books, unless the order is accompanied by other satisfactory references. We mention this because new industrial enterprises even when very important, are often not listed in the reference books, which causes much delay in obtaining information.

For goods ordered to be sent by express, the **bill to be collected on delivery,** a remittance to cover packing and expressage both ways is required with the order. **Express-charges for collection will be added to the amount of the bill.**

By sending full remittance with the order, buyers will save the charges for collecting the amount of the bill, and will avoid delay in delivery.

For special goods to be made to order and not listed by us we invariably require payment when the order is placed.

Small articles can be sent by mail in open packages at 1 cent per ounce, and this postage must be added to the price of the goods so ordered, **but we are not responsible for goods lost or injured in transmission by mail.**

Registering mail matter lessens the risk of loss.

The "Home Ins. Co." insures the delivery of mail packages in the U. S. and Canada at the rate of 5 cents for each $5.00 of value. We insure in this way when so ordered or when insuring seems advisable.

As we use every precaution in packing goods, no allowance can be made if goods are damaged in direct shipment or in enclosure through other houses.

Boxes, which may be required for packing, will be charged at cost.

We must decline to send goods on approval, but we hold ourselves accountable for the correctness of the descriptions of our goods in this catalogue.

Should any of our goods not prove satisfactory, we solicit prompt information; any complaints shall have our careful attention, as we aim to satisfy our patrons in every respect, in order to maintain the reputation we are now enjoying.

*The prices of some of the more bulky or heavy goods are slightly higher at our Branches than in New York, on account of the very high transportation charges.

KEUFFEL & ESSER CO. NEW YORK.

DRAWING PAPERS
IN SHEETS.

WHATMAN'S HAND-MADE.

Whatman's Drawing Papers "**Selected Best**" and "**Retree**" are made as one quality and the sheets are afterwards examined and separated at the mill. The sheets without imperfections are called "**Selected Best.**" Both bear either the watermark "WHATMAN" or "WHATMAN TURKEY MILLS."

These papers are made with three different styles of surface:

HP. signifies "**Hot Pressed**", has a smooth surface; mostly used for pencil and very fine line-drawings.

N. signifies "**Not Hot Pressed**", has a finely grained surface; used for general purposes and water-color drawing.

R. signifies "**Rough**" (Torchon Paper), has a coarsely grained surface; used for very bold drawing, sketching and water-color drawing.

In ordering please state Catalogue NUMBER, SIZE and SURFACE (HP. N. or R.)

1. Whatman's, with "**HP**" or "**N**" surface.

Cap	13 × 17 in.	per quire	$	60
Demy	15 × 20 "	"		90
Medium	17 × 22 "	"	1	25
Royal	19 × 24 "	"	1	55
Super Royal	19 × 27 "	"	1	85
Imperial	22 × 30 "	"	2	60
Atlas	26 × 34 "	"	3	55
Double Elephant	27 × 40 "	"	4	80
Antiquarian	31 × 53 "	"	14	75
"	31 × 53 "	per sheet		80

1 A. Whatman's, with "**HP**" or "**N**" surface. **Selected Best.**

Cap	13 × 17 in.	per quire	$	80
Demy	15 × 20 "	"		95
Medium	17 × 22 "	"	1	40
Royal	19 × 24 "	"	1	80
Super Royal	19 × 27 "	"	2	10
Imperial	22 × 30 "	"	3	00
Atlas	26 × 34 "	"	4	60
Double Elephant	27 × 40 "	"	5	75
Antiquarian	31 × 53 "	"	27	00
"	31 × 53 "	per sheet	1	50

2. Whatman's, with "**R**" surface. **Selected Best only.**

Royal	19 × 24 in.	per quire	$ 1 80	per sheet	$	10
Imperial	22 × 30 "	"	3 00	"		18
Double Elephant	27 × 40 "	"	5 75	"		30

3. Whatman's, Extra heavy, with surface as below. **Selected Best only.**

Royal	19 × 24 in.	**N.** or **R.**	per quire $ 3 45	per sheet	$	20
Imperial	22 × 30 "	**HP., N.** or **R.**	" 6 90	"		40
Double Elephant	27 × 40 "	**HP., N.** or **R.**	" 10 35	"		60

For Mounted Whatman's papers see page 14.

For shipping sheet papers packed flat, the packing charges are about 5 cents per sq. ft.

KEUFFEL & ESSER CO. NEW YORK.



Reduced fac-simile of the label of Universal Paper in Sheets.

4. **Universal** Paper. (Each sheet watermarked *Universal*)

Universal Drawing Paper is of pure stock, free from adulterations, of natural white color and very carefully sized. A perfect, porous, soft and uniform pencil mark can be produced on it, it takes ink and color well, and its erasing properties are perfect, making it the best and most popular paper for **Colleges** and **Schools**. It is also a very good paper for water colors.

The several sizes are of different thickness, the smallest size being the thinnest and the others progressively thicker. See description, page 10.

Cap	13½ × 17 in.	per ream	$ 5 75	per quire	$ 33
Demy	15 × 20 "	"	8 70	"	50
Medium	17 × 22 "	"	11 50	"	66
Royal	19 × 24 "	"	14 60	"	84
Super Royal . .	19 × 27 "	"	17 40	"	1 00
Imperial . . .	22 × 30 "	"	22 60	"	1 30
Double Elephant	27 × 40 "	"	43 50	"	2 50

Ream prices apply also to half-reams Royal and quarter-reams Imp'l. and Dbl. Elepht.

5. **Normal** Paper. Each sheet stamped 

A drawing paper of very superior quality of natural white color, with smooth surface for LINE DRAWINGS in ink or pencil. It stands erasing perfectly and is very tough. The 3 sizes are of the same thickness.

We highly recommend this paper for elaborate or complicated line drawings on account of its hard and smooth surface, and for working drawings on account of its strength and durability. It is used to a great extent in schools where machine drawing is taught.

Royal	19 × 24 in.	per ream	$28 75	per quire	$ 1 65
Imperial . . .	22 × 30 "	"	41 00	"	2 35
Double Elephant	27 × 40 "	"	62 75	"	3 60

Ream prices apply also to half-reams Royal and quarter-reams Imp'l and Dbl. Elepht.

6. **Lava** A pearl-grey drawing paper of good quality with slightly grained surface. Its soft color lends a fine effect to pen and ink drawings. See description, page 10. The 3 sizes are of the same thickness.

Royal	19 × 24 in.	. . . . .	per quire	$ 1 10
Imperial . . .	22 × 30 "	. . . . .	"	1 60
Double Elephant	27 × 40 "	. . . . .	"	2 60

7. **Ariston** Paper. Each sheet Stamped 

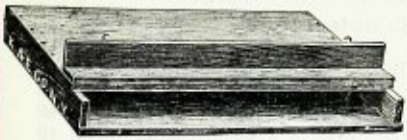
A paper for the most fastidious; pure white and of hitherto unattained uniformity and firmness of surface, equally well adapted for pencil, ink and colors. Recommended for specially fine drawings. See description, page 12. The 3 sizes are of the same thickness.

Royal	19 × 24 in.	. . . . .	per quire	$ 2 10
Imperial . . .	22 × 30 "	. . . . .	"	3 25
Double Elephant	27 × 40 "	. . . . .	"	6 00

Samples sent on application, or general sample book for 15c.

For shipping sheet papers packed flat, the packing charges are about 5 cents per sq. ft.

7B. **Boxes for Drawing Paper,** to hold one-half ream.



(Light but substantial box, well finished, with hinged front, for storing paper flat.)

for Royal	19 × 24 in.	each	$2 25
for Imperial	22 × 30 "	"	2 60
for Dbl. Elepht.	27 × 40 "	"	3 25

8. *Paragon* Paper, ☞ see description page 11.

Each sheet stamped 

Paragon Paper is a natural white drawing paper of very fine quality, excellent for any kind of drawing, pen, pencil or water color, will not turn brittle with age and has erasing qualities which are possible only in a paper of this high grade. We warrant every piece of Paragon paper to fully bear out our recommendation.

The Royal and Imperial sizes are both of the same thickness; the two kinds of paper of Double Elephant size are also both of the same thickness, but heavier than the smaller sizes. No. 8 has a sand-grain or pebbled surface, No. 9 is smooth.

Royal, ...	Rough, thin,	19 × 24 in.	per quire	$ 1 80
Imperial	" "	22 × 30 "	"	2 75
Double Elephant,	Rough, medium,	27 × 40 "	"	5 25

9. *Paragon* Paper, Each sheet stamped 

Double Elephant, Smooth, medium, 27 × 40 in. per quire $ 5 25

10. *Duplex* Paper, medium, cream color, ☞ see description page 9.

Each sheet stamped 

Duplex Papers are tough and hard, with slight grain, stand erasing very well and take pencil, ink and colors perfectly. Their tint is agreeable to the eye and permits of handling without soiling.

Royal	19 × 24 in.	per ream	$ 18 70	per quire	$ 1 10
Imperial . . .	22 × 30 "	"	"	27 20	"	1 60
Double Royal .	24 × 36 "	"	"	35 70	"	2 10
Double Elephant	27 × 40 "	"	"	44 20	"	2 60

Ream prices apply also to half-reams Royal and quarter-reams Imp'l, and Double Elephant.

11. *Duplex* Paper, thick, drab color, ☞ see description page 9.

Each sheet stamped 

Double Elephant 27 × 40 in. . . . . per quire $ 3 10

15. **K & E Ledger Paper.**

An excellent white ledger paper of medium weight, with smooth surface.

16 × 21 in.	per quire	$ 60
18 × 23 "	"	70

16. **K & E Bond Paper.**

An exceedingly tough paper of light weight, of natural white color, permits of folding (creasing) to nearly any extent and is therefore specially well adapted for maps and drawings which are to be carried in the pocket.

Royal	19 × 24 in.	per quire	$ 75
Imperial	22 × 30 "	"	1 00
Double Elephant	27 × 40 "	"	1 75

Samples sent on application, or general sample book for 15c.

For shipping sheet papers packed flat, the packing charges are about 5 cents per square ft.

REYNOLDS' BRISTOL BOARDS

17. Reynolds' Bristol Board, white, smooth surface.

			2 ply	3 ply	4 ply
Cap	$12\frac{1}{2} \times 15\frac{1}{4}$ in.	per doz. . .	$ 60	90	1 20
Demy . . .	$14\frac{5}{8} \times 18\frac{1}{4}$ "	" . .	90	1 35	1 75
Medium . .	$16\frac{1}{4} \times 20\frac{3}{4}$ "	" . .	1 20	1 80	2 40
Royal . . .	$18\frac{1}{4} \times 22\frac{3}{8}$ "	" . .	1 50	2 40	3 10
Imperial .	$21\frac{1}{2} \times 28\frac{3}{4}$ "	" . .	— —	— —	6 00

17 P. Reynolds' Bristol Board, printed with border etc , for U. S. Patent Office drawings. 10 × 15 in., 3 ply, gross, $11 35, doz. $1 05

17 PL. do. do. do. 10 × 15 " 2 " " 8 10, " 75

18. English Parchment, best quality. (genuine parchment, made of animal skin).

	14 × 18	16 × 20	18 × 24	24 × 28
per sheet . .	50	70	90	1 25

19. Gelatine or Glasspaper.

	thin	medium	thick
13 × 19 in., per sheet	$ 20	25	30

20. Polygraph Transfer Paper, black, blue, vermilion, graphite.
10 × 15 in. . . . . per quire $ .40, per sheet $ 02

K & E SUPERIOR BRISTOL BOARDS.



Stamped with Trade-Mark:



K & E Bristol Board has a hard surface, possesses almost unlimited erasing properties and can be rolled without injury. It has the thickness, color, quality and size required by the U. S. Patent Office and is preferable to other Bristol Boards, because it does not have their high glossy surface. As it is less opaque than other Bristol Boards, photoprints can be made from it with fair results. Nos. 21 L and 22 L are thinner than Nos. 21 and 22 and are therefore better adapted to print from.

BLANK (NOT PRINTED)

21. K & E Patent Office Bristol Board, 3 sheet, blank.
10 × 15 in. (U. S. size) . . . . per gross $ 6 00, per doz. $ 60
15 × 20 " (English size) . . . " " 12 00, " " 1 20

21L. K & E Patent Office Bristol Board, 2 sheet, blank.
10 × 15 in. (U. S. Size) . . . . per gross $ 5 00, per doz. $ 50

(PRINTED WITH BORDER ETC.)

22. K & E Patent Office Bristol Board, 3 sheet, printed
10 × 15 in. . . per gross $ 7 50, per doz. $ 75

22L. K & E Patent Office Bristol Board, 2 sheet, printed
10 × 15 in. . . per gross $ 6 50, per doz. $ 65

Samples sent on application, or general sample book for 15c.

For shipping Bristol Board flat, the packing charges are about 5 cents per square foot.

PARAGON DRAWING CARD.

Each sheet stamped 

23. Paragon Drawing Card, rough, 19 × 24 in. . . . per sheet $ 20
do. do. " 22 × 30 " . . . " 30
do. do. " 27 × 40 " . . . " 90

24. Paragon Drawing Card, smooth, 19 × 24 in. . . per sheet $ 20
do. do. " 22 × 30 " . . " 30
do. do. " 27 × 40 " . . " 90

This excellent Drawing Card is adapted for fine drawings, perspectives, water-color drawings, etc. The slightly rough surface is similar to Whatman's "Not Hot Pressed."

No. 24 is like No. 23, but with smooth surface, similar to Whatman's "Hot Pressed."

25. Tinted Cardboard, for drawings,
Grey . . . . 22 × 28 in. . . . . per doz. $ 2 50 per sheet $ 25
Black . . . 22 × 28 " . . . . " 2 00 " 20

26. White Mounting Board.

	22 × 28 4 ply.	22 × 28 6 ply.	22 × 28 8 ply.	22 × 28 10 ply.	30 × 40 in. 10 ply.
per doz. . .	$ 75	1 00	1 20	1 50	3 00
per sheet . .	08	10	12	15	30

28. Rubber Cloth, black, 36 in. wide . . . . . per yard $ 45

This fabric is pliable and impervious to moisture, so that it makes an excellent cover for the drawing board and a good wrapper for drawings.

31. Adhesive Binding Strips (Crowell), ¾ in. wide, 50 feet in practical paper box . . . . . per box $ 25

Nos. 23 to 26 must be packed flat for shipment, as they would be injured by rolling. Packing charges are about 5 cents per square foot.

DETAIL PAPERS, CONTINUOUS.

(For Drawing Papers see page 9.)

SMOOTH MANILLA PAPERS.

The smooth Manilla papers, intended mainly for stencils and patterns, are occasionally used for detail and preliminary drawings. While we exercise all possible care in their selection, we can not assume any responsibility for their being suitable for drawing.

40. Smooth Manilla, three weights: X, XX, XXX, in rolls of about 100 pounds, 36, 40, 48, 54 in. wide, ... per pound $ 10

MANILLA TISSUE PAPER.

46. Manilla Tissue Paper. 48 in. wide, ... per roll of 50 yards $1 60
" " 100 " 3 00

This Paper takes ink and pencil, stands erasing, is strong and tough, and can be used for coarse tracings.

TRANSPARENT SKETCHING PAPERS.



Reduced fac-simile of label of Economy paper.

Economy Sketching Papers are excellent all-around **detail papers.** They are of natural white color, stand erasing by knife or rubber, take pencil, ink and colors well, and while tough and strong, are sufficiently transparent for coarse tracings, such as details. These many useful qualities, together with their moderate price, make the Economy papers superior detail papers and the best all-around sketching papers, from which also fair blueprints can be made.

47L. *Economy* Transparent Sketching Paper, white, light,

36 in. wide, in rolls of 50 yards, ... per roll $ 1 75
60 " " " " " 50 " . . . . . " " 2 60

47. *Economy* Transparent Sketching Paper, white, medium,

36 in. wide, in rolls of 50 yards, ... per roll $ 2 00
60 " " " " " 50 " . . . . . " 3 25

Samples sent on application, or general sample book for 15c.

SIMPLEX DETAIL PAPERS.



Reduced fac-simile of label of Simplex Paper

Simplex Detail Papers are made especially for us by one of the most expert manufacturers and possess the qualities of a drawing paper as far as they can be attained in manilla papers. The surface is slightly grained, rough enough to take the pencil readily and smooth enough for ink work. The color is a shade deeper than that of ordinary manilla paper, making it less liable to appear soiled. Special attention has been paid to the erasing qualities of these papers, and we recommend them as a considerable improvement over the manilla papers ordinarily used.

48 L. *Simplex* Detail Paper, light weight,

in rolls of about 100 pounds 36 or 42 in. wide, per pound $ 12

36 in. wide, per roll of 50 yards					$ 1 80	per roll of 100 yards			3 25
42 "	"	"	"	50	" 2 10	"	"	100 "	3 75

48. *Simplex* Detail Paper, medium, in rolls of about 100 pounds,

36, 42, 48 or 54 in. wide, ... per pound $ 12

36 in. wide, per roll of 50 yards					$ 2 25	per roll of 100 yards			4 00
42 "	"	"	"	50	" 2 60	"	"	100 "	4 70
48 "	"	"	"	50	" 2 95	"	"	100 "	5 35
54 "	"	"	"	50	" 3 25	"	"	100 "	6 00

48 R. *Simplex* Detail Paper, medium, with ribbed surface, in rolls of about 100 pounds, 36, 42 or 48 in. wide, . . . per pound $ 12

36 in. wide, per roll of 50 yards					$ 2 25	per roll of 100 yards			4 00
42 "	"	"	"	50	" 2 60	"	"	100 "	4 70
48 "	"	"	"	50	" 2 95	"	"	100 "	5 35

49. *Simplex* Detail Paper, heavy, in rolls of about 100 pounds,

36, 42, 48 or 54 in. wide, ... per pound $ 12

36 in. wide, per roll of 50 yards					$ 2 75	per roll of 100 yards			5 00
42 "	"	"	"	50	" 3 10	"	"	100 "	5 75
48 "	"	"	"	50	" 3 65	"	"	100 "	6 75
54 "	"	"	"	50	" 4 00	"	"	100 "	7 50

Samples sent on application, or general sample book for 15c.

DRAWING PAPER.

Good drawing paper must combine many different features, and these the buyer should be able to distinguish, to be in a position to discriminate between various kinds, so as to make a selection suitable to the purpose for which he intends to use the paper.

First in importance is the material from which the paper is made, and second the mode of manufacture, both of which become manifest when the finished article is used. Good drawing paper should be strong, of uniform thickness and surface, stretch evenly, and should neither repel nor absorb liquids. It should admit of considerable erasing without detriment to its surface, should not become either brittle or discolored by reasonable exposure and age, and should not wrinkle when stretched or when inks or colors are applied to it.

It is impossible to combine all these features in one paper, so that all may be apparent in their utmost degree of perfection; thus, the greatest strength cannot be combined with the finest surface, as is particularly exemplified in the case of manilla fibre, which, although one of the strongest materials used in the manufacture of paper, cannot be made into *drawing* paper.

The careful draftsman is therefore compelled to select that paper which unites to best advantage those qualities which are most adapted to his special requirements. To make a personal selection every time he is in need of paper is generally impracticable. He is therefore mostly obliged to rely upon the descriptions of the papers offered him, and then to trust that the one selected will be as described and can be obtained again in the same quality at any future time.

Each one of the papers listed in this catalogue possesses certain special and distinctive features of its own, which are set forth accurately and with a view to enabling the buyer to make a selection satisfying his wants. **Every one of our papers is made solely and specially for us, and can in no case be procured except from us, or from dealers who purchase their supply from us.** The qualities and distinctive features of each paper are strictly maintained and successive orders can be given with the assurance that the same article will invariably be furnished. **All our drawing papers are watermarked along the edge with their name.**

The following assortment has been made after careful study of the draftsman's wants, based on more than forty years' experience, and we believe it will be found to meet all requirements. It has been made comprehensive enough to answer all purposes, but no more so, in order that selection may be facilitated. No two of these papers possess all of the same features, nor are different designations and descriptions applied to the same paper, with a view to apparently increasing the assortment. Each paper has its own characteristics and will be found satisfactory, if selected with due regard to its special qualities.

The Helios and Parchmine Papers, listed on page 23, although specially made for blueprinting, are also good drawing papers and are very often used as such. They take ink, pencil and water colors and have good erasing qualities.

The good results of such a policy are manifested by the reputation gained by our

Paragon, Duplex, Universal, Anvil, Normal &c.

papers, whose trade-marks are looked upon by draftsmen all over the country as standards of excellence.

In consequence of this a great many imitations, especially of PARAGON and DUPLEX papers have been put on the market; they are offered under similar names and are palmed off as identical with our papers. *To protect our customers, we repeat that our papers cannot be obtained under another name or without their name along their edge.*

DRAWING PAPERS

CONTINUOUS IN ROLLS.



Reduced fac-similes of labels of our Drawing Papers.

50—52. **Duplex** A Detail Drawing Paper, which stands in a class by itself and is now so well known that it hardly requires description. It is excellent for any kind of drawing. The cream or buff color is agreeable to the eye and permits of handling without soiling.

Nos. 10 and 11 (on page 3) are the same papers in sheets.

Each roll water-marked Duplex

50. **Duplex** medium, cream color.

width in inches	30	36	42	56	62
rolls 30 to 40 pounds, per pound	$ 29	29	29	29	29
per 10 yard piece	1 15	1 35	1 70	2 15	2 50
per yard	13	15	20	25	30

52. **Duplex** thick, drab color.

width in inches	36	56
rolls 30 to 40 pounds, per pound	$ 29	29
per 10 yard piece	1 60	2 65
per yard	18	30

Samples sent on application, or general sample book for 15c.

55. **Universal** A natural white paper of good quality with slightly grained surface, suitable for work in ink, color, pencil or crayon. It is used for general office work, and on account of its price also for preliminary drawings, and probably more than all other papers in Technical Schools and Universities. Similar paper, generally offered under the name of "German Drawing Paper," should not be confounded with the "Universal."

No. 4 is the same paper in sheets, but of graded thickness, proportionate to each size.

Each roll water-marked Universal

55. **Universal**, medium.

width in inches,	36	42	56	62
rolls 30 to 40 pounds, per pound,	$ 40	40	40	40
per 10 yard piece,	1 70	2 00	3 00	3 40
per yard,	20	24	35	40

57 **Lava** A pearl-grey drawing paper, quality, texture and surface similar to the Universal. The neutral grey color lends a fine effect to pen-and-ink drawings.

Each roll water-marked Lava

57. **Lava**, medium.

width in inches,	36	62
rolls 30 to 40 pounds, per pound,	$ 40	40
per 10 yard piece,	1 70	3 40
per yard,	20	40

60—62. **Anvil** A very tough and hard natural white paper, matchless for working-drawings used out-of-doors or in the workshop where drawings are subject to rough handling. This paper has a slightly grained surface, similar to Whatman's "Not" and stands erasing to the greatest extent.

Each roll water-marked Anvil

60. **Anvil**, medium.

width in inches,	36	42	62
rolls 30 to 40 pounds, per pound,	$ 45	45	45
per 10 yard piece,	2 15	2 65	4 00
per yard,	25	30	45

62. **Anvil**, thick.

width in inches,	62	72
rolls 30 to 40 pounds, per pound,	$ 45	55
per 10 yard piece,	4 80	6 25
per yard,	50	70

Samples sent on application, or general sample book for 15c.

Paragon papers No.70—77 are so well and favorably known, that there is but little to say about them; their excellence is **universally acknowledged.**

We warrant Paragon Paper and exchange all which does not give perfect satisfaction.

Paragon Papers are of natural white color. Highly recommended for elevations

55. **Universal**, medium.

width in inches,	36	42	56	62
rolls 30 to 40 pounds, per pound,	$ 36	36	36	36

57. **Lava**, medium.

width in inches,	36	62
rolls 30 to 40 pounds, per pound,	$ 36	36

Paragon, rough, medium. width in inches 36 42 58

rolls 30 to 40 pounds, per pound, $ 50 50 50

per 10 yard piece, 3 00 3 50 4 50

per yard, 33 38 50

72. **Paragon**, rough, thick. . . . . width in inches **58**

rolls 30 to 40 pounds, per pound . . . . $ 50

" 10 yard piece 5 75

" yard 65

73. **Paragon**, rough, extra thick. . . . . width in inches **58**

rolls 30 to 40 pounds, per pound . . . . $ 50

" 10 yard piece 7 20

" yard 80

Nos. 75—76 have a grain like Whatman's "not hot pressed" on one side, while the other side is smooth, adapting them for drawings to be reproduced by photographic process. No. 77 has a slightly coarser grain than Nos. 75-76.

75. **Paragon**, smooth, medium. . . . . width in inches **36** **58**

rolls 30 to 40 pounds, per pound . . . . $ 50 50

" 10 yard piece 3 00 4 50

" yard 33 50

76. **Paragon**, smooth, thick. . . . . width in inches **58**

rolls 30 to 40 pounds, per pound . . . . $ 50

" 10 yard piece 5 75

" yard 65

77. **Paragon**, medium smooth, medium. . . . . width in inches **72**

rolls 30 to 40 pounds, per pound . . . . $ 55

" 10 yard piece 6 50

" yard 75

Samples sent on application, or general sample book for 15c.

55. **Universal** A natural white paper of good quality with slightly grained surface, suitable for work in ink, color, pencil or crayon. It is used for general [illegible] on account of its price also for preliminary drawings, and probably more [illegible] generally offered

57 **Lava** A pearl-grey drawing paper, quality, texture and surface similar to the Universal. The neutral grey color lends a fine effect to pen-and-ink drawings.

Each roll water-marked *Lava*

57. **Lava**, medium.

width in inches,	36	62
rolls 30 to 40 pounds, per pound,	$ 40	40
per 10 yard piece,	1 70	3 40
per yard,	20	40

60—62. **Anvil** A very tough and hard natural white paper, matchless for working-drawings used out-of-doors or in the workshop where drawings are subject to rough handling. This paper has a slightly grained surface, similar to Whatman's "Not" and stands erasing to the greatest extent.

Each roll water-marked *Anvil*

60. **Anvil**, medium.

width in inches,	36	42	62
rolls 30 to 40 pounds, per pound,	$ 45	45	45
per 10 yard piece,	2 15	2 65	4 00
per yard,	25	30	45

62. **Anvil**, thick.

width in inches,	62	72
rolls 30 to 40 pounds, per pound,	$ 45	55
per 10 yard piece,	4 80	6 25
per yard,	50	70

Samples sent on application, or general sample book for 15c.

Paragon papers No. 70—77 are so well and favorably known, that there is but little to say about them; their excellence is **universally acknowledged.**

We warrant Paragon Paper and exchange all which does not give perfect satisfaction.

Paragon Papers are of natural white color. Highly recommended for elevations, perspectives and most kinds of finished drawings.

We list some of these Paragon papers in sheets under Nos. 8 and 9, page. 3

Each roll water-marked Paragon.

Nos. 70—71—72—73 have a sand-grain or pebbled surface (similar to eggshells), adapted for general drawings, either in lines or in wash.

70. **Paragon**, rough, thin. . . . . width in inches **58**

rolls 30 to 40 pounds, per pound	$ 50
" 10 yard piece	4 00
" yard	45

71. **Paragon**, rough, medium. width in inches **36** **42** **58**

rolls 30 to 40 pounds, per pound,	$ 50	50	50
per 10 yard piece,	3 00	3 50	4 50
per yard,	33	38	50

72. **Paragon**, rough, thick. . . . . width in inches **58**

rolls 30 to 40 pounds, per pound	$ 50
" 10 yard piece	5 75
" yard	65

73. **Paragon** rough, extra thick. . . . . width in inches **58**

rolls 30 to 40 pounds, per pound	$ 50
" 10 yard piece	7 20
" yard	80

Nos. 75—76 have a grain like Whatman's "not hot pressed" on one side, while the other side is smooth, adapting them for drawings to be reproduced by photographic process. No. 77 has a slightly coarser grain than Nos. 75-76.

75. **Paragon**, smooth, medium. . . . . width in inches **36** **58**

rolls 30 to 40 pounds, per pound	$ 50	50
" 10 yard piece	3 00	4 50
" yard	33	50

76. **Paragon**, smooth, thick. . . . . width in inches **58**

rolls 30 to 40 pounds, per pound	$ 50
" 10 yard piece	5 75
" yard	65

77. **Paragon**, medium smooth, medium. . . . . width in inches **72**

rolls 30 to 40 pounds, per pound	$ 55
" 10 yard piece	6 50
" yard	75

Samples sent on application, or general sample book for 15c.

80. Ariston paper is the nearest approach to hand-made paper ever attained in a roll paper. It combines practically all the advantages of hand-made with the uniformity of machine-made paper. It is of the very best material obtainable and no expense has been spared to make it the **best paper that can be produced.** It is nearly homogeneous in texture, although the strength of the fibre is fully preserved, giving it a surface of hitherto unattained uniformity and firmness, equally well adapted to pencil, ink and colors and of excellent erasing quality. We recommend this paper for competitive drawings, engrossing, etc. No. 7 (page 2) is the same paper in sheets.

Each roll water-marked Ariston

80. Ariston, smooth, medium.	width in inches		**58**
	rolls 30 to 40 pounds, per pound	$	65
	" 10 yard piece		6 00
	" yard		70

STEINBACH'S PAPERS

93. Steinbach's Solar Printing and Crayon Paper, 53 in. wide, thin, per y'd		$	35
94. " " " " " " 53 " " thick "			50

DRAWING PARCHMENT

98. Drawing Parchment, medium, 38 in. wide, per roll of 20 yards	$	3 00

MOUNTED DRAWING PAPERS.

MOUNTED ON MUSLIN, IN ROLLS OF 10, 20, 30, 40 OR 50 YARDS.



Reduced fac-similes of labels of our mounted papers.

Our papers are mounted stretched, and air-dried. This refers also to 20, 30, 40 and 50 yard rolls and to papers in sheets of any size. They are therefore much superior to papers mounted by compression between rollers and dried by passing over heated rollers. The rollers distort and strain the paper and destroy the surface, while drying by heat injures the paper and the adhesive.

To protect our customers against faulty mounting or mounting on inferior muslin, we stamp the muslin side of our papers, when mounted by us, with their trade-mark name and "Keuffel & Esser Co.—Mounted Paper."

MOUNTED DRAWING PAPERS.

MOUNTED ON MUSLIN, IN ROLLS OF 10 TO 50 YARDS.

We list mounted papers in 10 yard rolls, but can furnish any of our mounted papers also in 20, 30, 40 or 50 yard rolls at proportionate prices.

For description of the papers see pages 9 — 12.

No. 100 is No. 55 mounted. For description see page 10.

100.	Universal	36 in. wide,	per 10 yard roll	$ 6 20	per yard	$	75
	do.	42 "	"	7 80	"		90
	do.	56 "	"	10 80	"	1	25
	do.	62 "	"	13 00	"	1	50

No. 103 is No. 50 mounted. For description see page 9.

103.	Duplex	36 in. wide,	per 10 yard roll	$ 5 85	per yard	$	70
	do.	42 "	"	7 50	"		90
	do.	56 "	"	9 95	"	1	15
	do.	62 "	"	12 10	"	1	40

No. 104 is No. 57 mounted. For description see page 10.

104.	Lava	36 in. wide,	per 10 yard roll	$ 6 20	per yard	$	75
		62 "	"	13 00	"	1	50

Nos. 105-106 are Nos. 60-62 mounted. For description see page 10.

105.	Anvil	36 in. wide,	per 10 yard roll	$ 6 65	per yard	$	80
	do.	42 "	"	8 45	"	1	00
	do.	62 "	"	13 60	"	1	60
106.	do.	62 "	"	14 40	"	1	75
	do.	72 "	"	18 00	"	2	25

Nos. 110, 111, 112, 113, 115, 116, 117, are Nos. 70, 71, 72, 73, 75, 76, 77 mounted. For description see page 11.

110.	Paragon	58 in. wide,	per 10 yard roll	$ 11 75	per yard	$ 1	35
111.	do.	36 "	"	7 50	"		90
	do.	42 "	"	9 30	"	1	10
	do.	58 "	"	12 50	"	1	45
112.	do.	58 "	"	13 75	"	1	60
113.	do.	58 "	"	15 70	"	1	80
115.	do.	36 "	"	7 50	"		90
	do.	58 "	"	12 50	"	1	45
116.	do.	58 "	"	13 75	"	1	60
117.	do.	72 "	"	18 25	"	2	25

No. 118 is No. 80 mounted. For description see page 12.

118.	Azistow	58 in. wide,	per 10 yard roll	$ 14 50	per yard	$ 1	75

FOR MOUNTED PAPERS IN SHEETS SEE NEXT PAGE.

Samples sent on application, or general sample book for 15c.

MOUNTED DRAWING PAPERS IN SHEETS.

MOUNTED ON MUSLIN.

125. *Unchangeable Drawing Board*

This Board consists of two sheets of drawing paper mounted on one side of strong muslin and so selected and chemically prepared that they form a flat and hard board which will neither contract nor expand under changing atmospheric conditions. For drawings which require extreme accuracy or are to be preserved on record, there is no material that will equal our Unchangeable Board.

The drawing surface is Paragon drawing paper.

Royal	19 × 24 in.	per sheet	$ 75
Imperial	22 × 30 "	"	1 10
Double Elephant.	27 × 40 "	"	1 65
Antiquarian . . .	31 × 53 "	"	2 75

Intermediate and larger sizes furnished to order

130. **Whatman's** Drawing Paper, mounted.

Royal	19 × 24 in.,	Selected Best,	per sheet	$ 30
Imperial	22 × 30 "	"	"	50
Double Elephant.	27 × 40 "	"	"	90
Antiquarian . .	31 × 53 "	"	"	2 10

131. **do.** Antiquarian 31 × 53 " Retree . . . . " 1 40

135. *Paragon* Drawing Paper, in sheets, mounted.

Our mounted Paragon Papers in sheets Nos. 135 and 137 are made of paper No. 71, unless No. 75 is ordered.

Royal	19 × 24 in.	per sheet	$ 32
Imperial	22 × 30 "	"	50
Double Elephant.	27 × 40 "	"	75
Antiquarian . . .	31 × 53 "	"	1 20

The prices for mounted papers in sheets, **except Whatman's papers**, are for muslin trimmed to the size of the sheet. If the muslin on Paragon papers is wanted larger than the paper on one or more edges, this must be explained in the order. Mounting on larger muslin slightly increases the price of the mounted sheet.

137. *Paragon* Drawing Paper, in sheets, **MOUNTED ON BOTH SIDES** of the muslin ("muslin between"), for record books, etc.

Royal	19 × 24 in.	per sheet	$ 65
Imperial	22 × 30 "	"	1 00
Double Elephant.	27 × 40 "	"	1 50
Antiquarian . . .	31 × 53 "	"	2 50

Mounted sheets of other size or of others of our papers furnished to order.

EXTRA LARGE SHEETS

for city, county, mine, etc., maps mounted to order. They are built up of two or more widths of paper. The joining edges are accurately beveled by a special machine and overlapped, producing a hardly perceptible and very durable seam. Our facilities in this line are unequalled and we have furnished perfect sheets as large as 20 × 30 feet, which were highly satisfactory and proved durable in use. Boxing of such sheets, which must be loosely rolled, is charged at cost, about 20 cents per foot of width.

Samples sent on application, or general sample book for 15c.

For shipping sheet papers flat, the packing charges are about 5 cents per square foot.

TRACING CLOTHS (VELLUM).

EXCELSIOR.

The Excelsior Tracing Cloth is far superior to any other, extremely transparent, and very uniform. It is therefore particularly well adapted for tracing faint or intricate drawings, and it is superior to any other cloth for tracings which are intended for copying by the blue, black or brown-printing process.

150. In rolls of 24 yards, **one side glazed, the other dull.**

	30	36	42 in. wide
per roll	$ 9 50	10 25	13 25
per yard	50	55	65

IMPERIAL.

156. In rolls of 24 yards, **one side glazed, the other dull.**
The 30, 36 and 42 in. widths are furnished also with **both sides glazed**

	30	36	38	42	48	54 in. wide
per roll	$ 8 10	9 00	11 10	12 10	16 00	17 00
per yard	40	45	55	60	80	85

SAGAR'S.

158. In rolls of 24 yards, **one side glazed, the other dull.**

	30	36	42 in. wide
per roll	$ 8 10	9 00	12 10
per yard	40	45	60

DOWSE'S.

159. In rolls of 24 yards, **one side glazed, the other dull.**

	30	36	42 in. wide
per roll	$ 6 40	7 40	10 00
per yard	35	40	56

UNION.

160. In rolls of 24 yards, **one side glazed, the other dull.**

	30	37	40	43 in. wide
per roll	$ 6 00	6 80	8 00	9 50
per yard	30	35	40	50

The Union Cloth is heavier and less transparent than the others.

Samples sent on application, or general sample book for 15c.

POUNCE FOR TRACING CLOTH.

166. Pounce for Tracing Cloth, in tin shakers . . . . . each $ 15

When cloth will not take ink readily, dust on a small quantity of the pounce and rub it in evenly with a soft fabric until the cloth has lost its excessive gloss. The pounce must be **thoroughly removed** before applying the ink.

TRACING PAPERS

in Sheets.





Reduced fac-similes of labels of our tracing papers.

170. *Vegetable* (not prepared) very tough and transparent.

Cap	13 × 17 in.	per quire	$ 90
Demy	16 × 20 "	"	1 25
Royal	19 × 25 "	"	2 00
Imperial	22 × 28 "	"	2 50
Double Elephant.	29 × 42 "	"	10 00

176. *Cupola* very tough and transparent, well adapted for photo-printing, 28 × 39 in. . . . . per quire $ 3 20

178. *Hermes* one side with slight grain.

20 × 30 in.	per quire	$ 95
30 × 40 "	"	1 90

180. *Ceres* (not prepared) tough and transparent, thin.

20 × 27 in.	per quire	$ 80
27 × 40 "	"	1 50

182. *Corona* (not prepared) like No. 180 but medium thick.

27 × 40 in. . . . . per quire $ 2 00

The **Vegetable, Ceres** and **Corona** listed above, and the **Parchment, Alba, Lotus** and **Libra** Papers on the next page are **natural** (not prepared) tracing papers. They will not discolor nor become brittle with age.

Samples sent on application, or general sample book for 15c.

TRACING PAPERS

continuous in rolls.



Reduced fac-similes of labels of our tracing papers.



190. **Parchment** (not prepared) **medium**, very tough.
37 in. wide, in rolls of 20 yards . . . . . per roll $ 3 50

191. **Parchment** (not prepared) **thick**, very tough.
37 in. wide, in rolls of 20 yards . . . . . " 4 30

192. **Niacus** very thin and transparent.
42 in. wide, in rolls of 10 yards . . . . . " 2 75

194. **Patera** stout, very tough, suitable for machine shops.
42 in. wide, in rolls of 20 yards . . . . . " 3 75

195 T.—M. Colonna, very tough and transparent, excellent tracing papers which can often be substitued for tracing cloth (vellum). They make fine photo prints

195T. **Colonna** thin,	30	36	42	in. wide,
per roll of 20 yards	$2 25	2 75	3 25	
195M **Colonna** medium,	30	36	42	in. wide,
per roll of 20 yards	$2 60	3 20	3 80	

196. **Corinthian** very tough and transparent, well adapted for photo-printing. 39 in. wide, in rolls of 20 yards per roll $ 3 20

198. **Gothic** very tough and transparent.
42 in. wide, in rolls of 20 yards . . . . . " 3 40

200 **Doric** medium. 42 in. wide, in rolls of 20 yards . . " 2 60

202. **Alba** (not prepared) for transferring.	42	54 in. wide,
rolls of 44 yards . . . . . per roll	$3 60	4 60
" " 22 " . . . . . "	1 80	2 30

204. **Lotus** (not prepared) transparent and tough, **thin.**
42 in. wide, in rolls of 20 yards . . . . . per roll $ 1 50

206. **Libra** (not prepared) like No. 204 but **medium thick.**
42 in. wide, in rolls of 20 yards . . . . . " 2 00

47. **Economy** Transparent Sketching Paper, see page 6.

Samples sent on application, or general sample book for 15c.

PHOTO-PRINTING.

There are three different processes in general use for copying drawings by means of light, namely:

Blue print Process, negative, white lines on **blue background,**
Black print Process, positive, black lines on **white background** and
Maduro Process, negative, white lines on **black-brown background.**

Maduro prints on thin paper can be used as negatives for printing, like tracings, when they will make positive prints (lines on white background). When many prints are to be made from one tracing, negative Maduro prints will save time and wear of the tracing.

Other processes are either too complicated in their manipulation, or uncertain in result or they necessitate a darkroom and other appliances, forbidding their general use. The results obtained by the above processes depend upon the careful selection and application of the chemicals and essentially upon the quality of the paper employed. It has therefore always been our endeavor to maintain the high quality of our papers and improve our formulas for coating these papers, and to produce papers best adapted for their purpose. The reputation which our several brands of photo-printing paper enjoy, proves that our efforts have been successful, and that our papers may be depended upon for the work for which we recommend them.

OUR PAPERS ARE WATERMARKED WITH THEIR NAME, ALONG THE EDGE.

Please note, that each roll of our Photo-printing Papers bears a serial number along the edge of the label. Should the results obtained with any of our papers not be quite satisfactory, our customers are requested to send us a sample print together with a piece of unexposed paper, protected from light and moisture and ROLLED, (not creased or folded); also that part of the label which bears the SERIAL NUMBER of the roll. This will enable us to ascertain where the fault lies and to explain or correct the trouble.

Our book "Photo-Printing from Tracings," giving full directions, will be mailed free on application.

PRINTING FOR THE TRADE.

We have a well equipped plant at our New York House and at our Branch Houses at Chicago, St Louis and San Francisco
for Blue-printing and Black-printing of any kind by sun or electric light. Our work is prompt and of the highest quality, and tracings are carefully guarded.

IMPORTANT NOTICE!

To insure the best results from blueprint papers, and cloths the order should state the desired speed, whether they are intended for sunlight or electric-light exposure or for use in an electric printing machine.

Our blueprint papers are furnished as follows:

Regular, requiring from 4 to 8 minutes exposure in bright sunlight. This will be found the most satisfactory in keeping, handling and in regard to quality and appearance of prints.

Quick, intended for use where prints are required quickly, or where no good light is available. Quick papers require more careful keeping and protection from light before exposure, than the regular.

Electric Quick, for use with electric light and in electric printing machines.

When blueprint paper is required for printing from negatives (blue lines on white ground) we request that this be stated in the order.

We can furnish also paper of other speeds to meet unusual conditions but in such cases the exact conditions should be explained in the order, to obtain the best possible results.

We can furnish our prepared papers also in sheets, if ordered in reasonably large quantities, but we do not list sizes, as they are cut to order.

HELIOS BLUEPRINT PAPERS.



Reduced fac-similes of labels of Prepared Papers.

Helios Paper, the first Blueprint Paper introduced by us, is still acknowledged to be the best and most reliable. For fine blueprints, it has no equal.

Helios Paper, medium, **prepared**, continuous.

		24	27	30	36	42	54* in. wide,
220.	per roll of 10 yards	$ 1 15	1 25	1 40	1 70	2 00	3 00
220X.	" " " 50 "	5 50	6 00	6 75	8 25	9 75	12 50

Helios Paper, thick, **prepared**, continuous.

		24	27	30	36	42	54* in. wide,
221.	per roll of 10 yards	$ 1 35	1 50	1 65	2 00	2 35	3 50
221X.	" " " 50 "	6 50	7 25	8 00	9 75	11 50	15 00

*The 54-inch width is prepared to order only.

E. T. BLUEPRINT PAPER. (Mailing Weight.)

E. T. Paper is of the same high quality as Helios, but is very thin and tough and is intended for prints for mailing, saving postage by its light weight.

E. T. Paper (extra thin, mailing weight), **prepared**, continuous.

		24	30	36	42 in. wide,
225.	per roll of 10 yards	$ 85	1 00	1 20	1 45
225X.	" " " 50 "	3 95	4 75	5 80	7 00

PARCHMINE BLUEPRINT PAPERS.

Parchmine Papers are fine blueprint papers, which will often be found useful on account of their great strength and toughness which adapt them for prints intended to be filed for record or to stand much handling.

PARCHMINE PAPER, light weight, **prepared**, continuous.

		30	36	42 in. wide.
222 L.	per roll of 10 yards	$ 90	1 05	1 20
222 LX.	" 50 "	4 25	5 00	5 75

PARCHMINE PAPER, medium thick, **prepared**, continuous.

		30	36	42 in. wide,
222.	per roll of 10 yards	$ 1 00	1 15	1 30
222X.	" 50 "	4 80	5 40	6 00

PARCHMINE PAPER, thick, **prepared**, continuous.

		30	36	42 in. wide
223.	per roll of 10 yards	$ 1 20	1 35	1 50
223X.	" 50 "	5 60	6 40	7 20

Sample Prints sent on application.

For unprepared papers see page 23.

COLUMBIA BLUEPRINT PAPERS.



Reduced fac-similes of labels of prepared Columbia Papers.



Columbia Papers are intended for the more general employment of blueprints, where the price is a consideration, as for distribution, proposals, etc. They compare favorably, with the papers generally put on the market as "First-class blueprint paper."

COLUMBIA PAPER, light weight, **prepared**, continuous.

		24	30	36	42	in. wide,
224L	per roll of 10 yards	$ 65	75	85	95	
224LX	" 50 "	3 00	3 50	4 00	4 50	

COLUMBIA PAPER, medium thick, **prepared**, continuous.

		24	30	36	42	54*	in. wide,
224	per roll of 10 yards	$ 70	80	90	1 00	1 50	
224X.	" 50 "	3 15	3 75	4 30	4 85	7 30	

*The 54 in. width is prepared to order only.

COLUMBIA PAPER, thick, **prepared**, continuous

		24	30	36	42	in. wide,
224¼.	per roll of 10 yards	$ 85	1 00	1 15	1 30	
224½X.	" 50 "	4 00	4 75	5 50	6 25	

COLUMBIA PAPER, thin, **prepared**, continuous, (mailing weight.)

		24	30	36	42	in. wide,
225¼.	per roll of 10 yards	$ 65	75	85	95	
225½X.	" 50 "	3 00	3 50	4 00	4 50	

COLUMBIA BLUEPRINT CLOTHS.



Reduced fac-simile of label of Columbia Blueprint Cloth

Columbia Blueprint Cloth on account of its strength is preferred for prints intended for rough handling, especially in out-door work.

228L. COLUMBIA CLOTH, **prepared**, light weight, continuous.

	36	42	in. wide,
per roll of 10 yards	$ 4 00	5 00	

228. COLUMBIA CLOTH, **prepared**, medium, continuous.

	30	36	42	54*	in. wide,
per roll of 10 yards	$ 2 90	3 20	4 40	6 00	

*The 54 in. width is prepared to order only.

Sample Prints sent on application.

For unprepared papers and cloth see page 23.

BLACKPRINT PAPERS.

NIGROSINE PAPER.

Positive Prints: Black Lines on White Background.



Reduced fac-simile of label of Nigrosine Paper.

Nigrosine Paper gives a positive black print of the tracing on a white background. These prints can be colored, added to, altered etc., like a drawing. This paper requires a chemical developing bath.

226. *Nigrosine* Black Process Paper, **prepared**, continuous.

	30	36	42 in. wide,
per roll of 10 yards	$ 1 50	1 80	2 10

227. *Nigrosine* Developer for Nigrosine Process (powder).

	4	8	16 ounce jar,
per jar	$ 50	90	1 60

Directions for printing and developing furnished with each roll.

MADURO PAPER.

For *Maduro* Papers and Cloths, see next page.

TUBES FOR STORING PREPARED PAPER.



These tubes are of tin, with well fitting covers, and are the best and most practical receptacles for storing cut rolls of prepared paper, because they exclude both light and moisture. They are well adapted also for storing tracings, plans, drawings, &c.

No. 219 has screw cap, No. 219X, has pull-off cover.

Tubes for Storing Paper,	for 24	30	36	42 in.
219. for 10 yard rolls, each	$ 80	95	1 00	1 10
219 X. " 50 " " "	95	1 10	1 25	1 35

Sample Prints sent on application.

MADURO PAPERS AND CLOTHS.

Negative Prints: White Lines on Black-Brown Background.

(Maduro Prints serve also as Negatives for making Positive Prints.)



Reduced fac-similes of labels of Maduro Paper and Cloth.



Maduro Paper and **Cloth** give a negative, white-line copy of the original on black-brown background. As this background is **impervious to light**, these prints can, when made on **THIN MADURO PAPER** or **CLOTH**, be used as negatives from which any number of **POSITIVE PRINTS** of the original can be taken. When many prints are to be made from one tracing, a number of Maduro prints on thin paper can be made, and used as negatives to make many positive prints simultaneously and without risk of damaging or wearing the original tracing.

BLUEPRINTS OR MADURO PRINTS FROM A (NEGATIVE) MADURO PRINT ON THIN PAPER OR CLOTH WILL BE FAC-SIMILES OF THE ORIGINAL DRAWING OR TRACING, i. e. BLUE OR BLACK-BROWN LINES ON A WHITE BACKGROUND.

Directions and a box of Fixing Salt, 229 S., furnished with each roll.

Maduro Paper, thin, **prepared**, continuous. (also for negatives.)

	30	36	42 in. wide,
229T. per roll of 10 yards.	$ 1 75	2 00	2 25
229TX. " " 50 "	8 50	9 75	11 00

Maduro Paper, medium, **prepared**, continuous.

	30	36	42 in. wide,
229M. per roll of 10 yards,	$ 1 75	2 00	2 25
229MX. " " 50 "	8 50	9 75	11 00

Maduro Paper heavy, **prepared**, continuous.

	30	36	42 in. wide,
229½. per roll of 10 yards.	$ 2 00	2 25	2 50
229½X. " " " 50 "	9 75	11 00	12 25

Maduro **Cloth**, light weight, **prepared**, continuous.

	36	42 in. wide,
229 C L. per roll of 10 yards.	$ 5 50	6 60

Maduro **Cloth**, medium, **prepared**, continuous.

	30	36	42 in. wide,
229 C. per roll of 10 yards.	$ 4 00	4 50	5 75

Maduro Cloth, like Columbia Cloth, is very strong and tough, and adapted for prints for out-door use or rough handling.

Maduro **Fixing Salt,**

	4	8	16 oz, box
229S. . . . . per box,	15	25	40

Sample Prints sent on application.

Papers and Cloth for Blueprinting.

(UNPREPARED



Reduced fac-similes of labels of (unprepared) Helios and E. T. Papers.



230. *Helios* Paper, medium thick, **unprepared.**

	24	27	30	36	42	54 in. wide,
per roll of 50 yds.	$ 3 55	4 00	4 45	5 35	6 25	8 00

231. *Helios* Paper, thick, **unprepared.**

	24	27	30	36	42	54 in. wide,
per roll of 50 yds.	$ 4 65	5 10	5 65	6 80	7 90	10 15

235. *E. T.* Paper, very thin and tough, **unprepared,** mailing weight.

	24	30	36	42 in. wide,
per roll of 50 yards	$ 2 00	2 45	2 90	3 50

232. PARCHMINE PAPER, medium thick, **unprepared.**

	30	36	42 in. wide,
per roll of 50 yards	$ 3 30	$ 3 90	4 50

233. PARCHMINE PAPER, thick, **unprepared.**

	30	36	42 in. wide,
per roll of 50 yards	$ 3 95	$ 4 75	5 55

234. COLUMBIA PAPER, medium thick, **unprepared.**

	24	30	36	42	54 in. wide,
per roll of 50 yards	$ 1 90	2 35	2 80	3 30	4 25

234½. COLUMBIA PAPER, thick, **unprepared.**

	24	30	36	42 in. wide,
per roll of 50 yards	$ 2 75	3 35	4 00	4 70

238. COLUMBIA CLOTH, **medium thick, unprepared.**

	30	36	42	54 in. wide.
per roll of 10 yards	$ 2 40	2 70	3 80	4 60

Samples sent on application, or general sample book for 15c.



ERASING FLUIDS

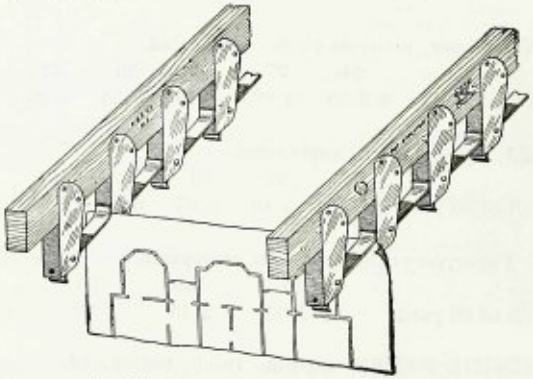
for making Alterations and Additions on Prints.

240W. **HELIOS** Erasing Fluid, for Blueprints, **white**, per bottle $ 20
240 R. do. do. **red**, " " 20
240 Y. do. do. **yellow**, " " 20
240 M. **MADURO** Erasing Fluid, for Maduro prints, **white** . . . . " 20

For white pencils for marking on blueprints see page 290.

K & E AUTOMATIC PRINT HANGER.

Patent Oct. 25, 1904.



249-4 K & E Automatic Print Hanger, bar with 10 holders, each bar $1 50
249-5 " " " " " " 20 " " " 3 00
249-6 " " " " " " 25 " " " 3 75
249-7 " " " " " " 30 " " " 4 50
249-8 " " " " " " 35 " " " 5 25

We quote single bars, as it depends on the size of the print whether it requires 1 or 2 or more bars to prevent sagging of the wet print between the points of suspension.

This automatic hanger for blueprints etc., economizes space, saves much time and labor in drying prints, will not tear the paper and avoids crumpling of the prints. The metal holders are attached to a wooden bar, each holder having a loosely jointed tongue. When a print is inserted it raises the tongue which, dropping back, firmly locks the print. To remove the print, the tongue is raised by extending one finger under it. The metal holders are about 2½ inches apart, giving ample circulation of air between the suspended prints.

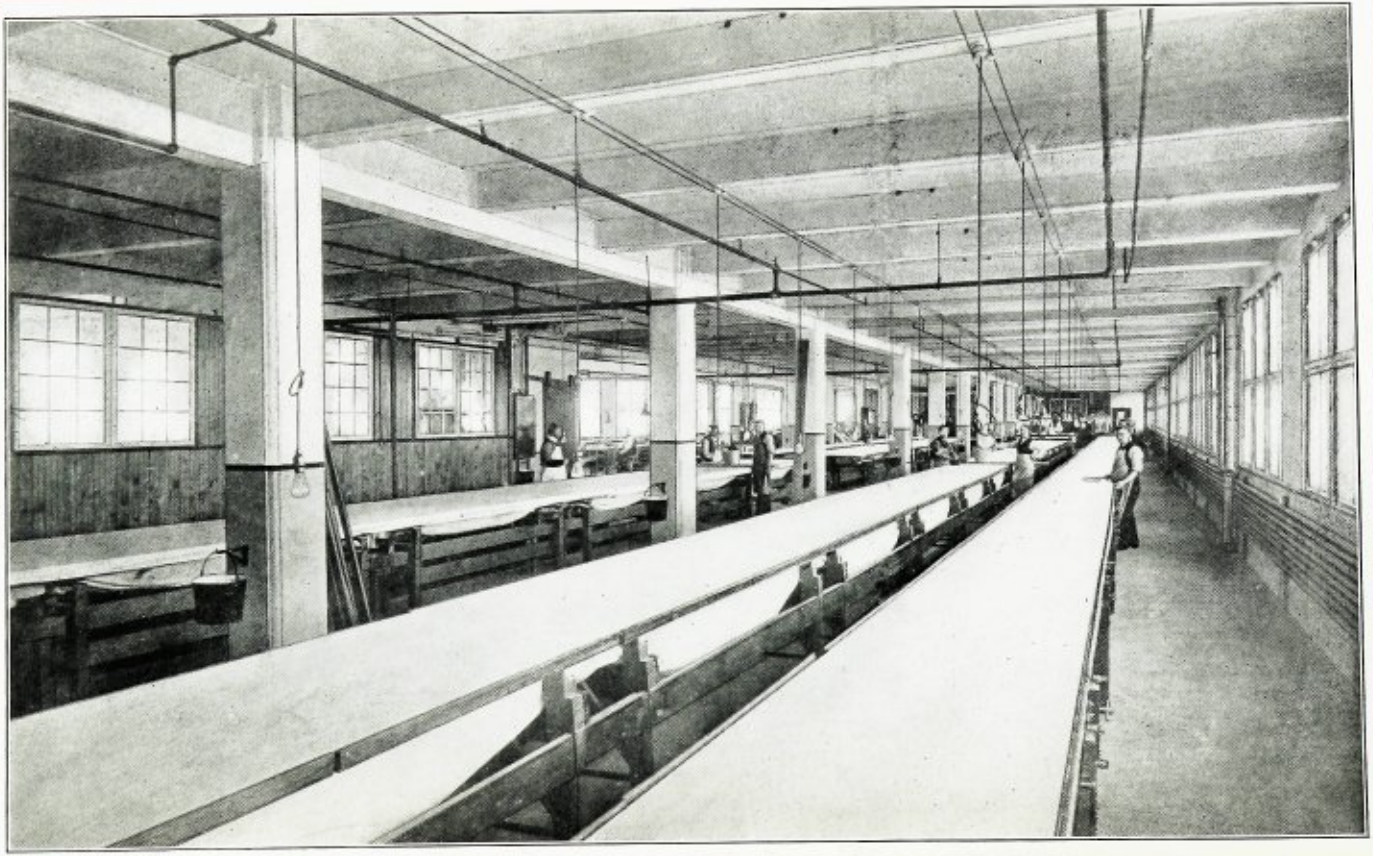
SPRING CLIPS.



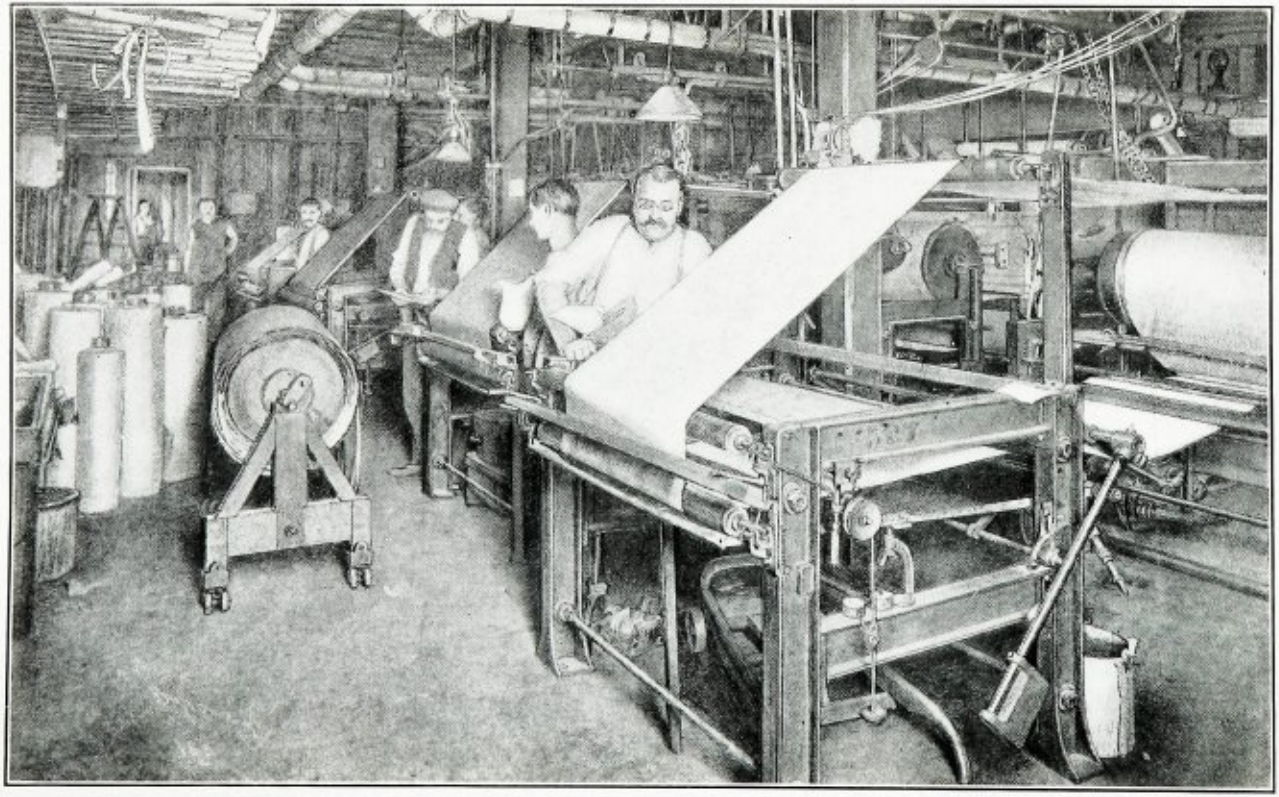
No. 249-3.

249-3 Spring clips, for clamping prints when drying . . . . . doz. $ 25

KEUFFEL & ESSER CO. NEW YORK.



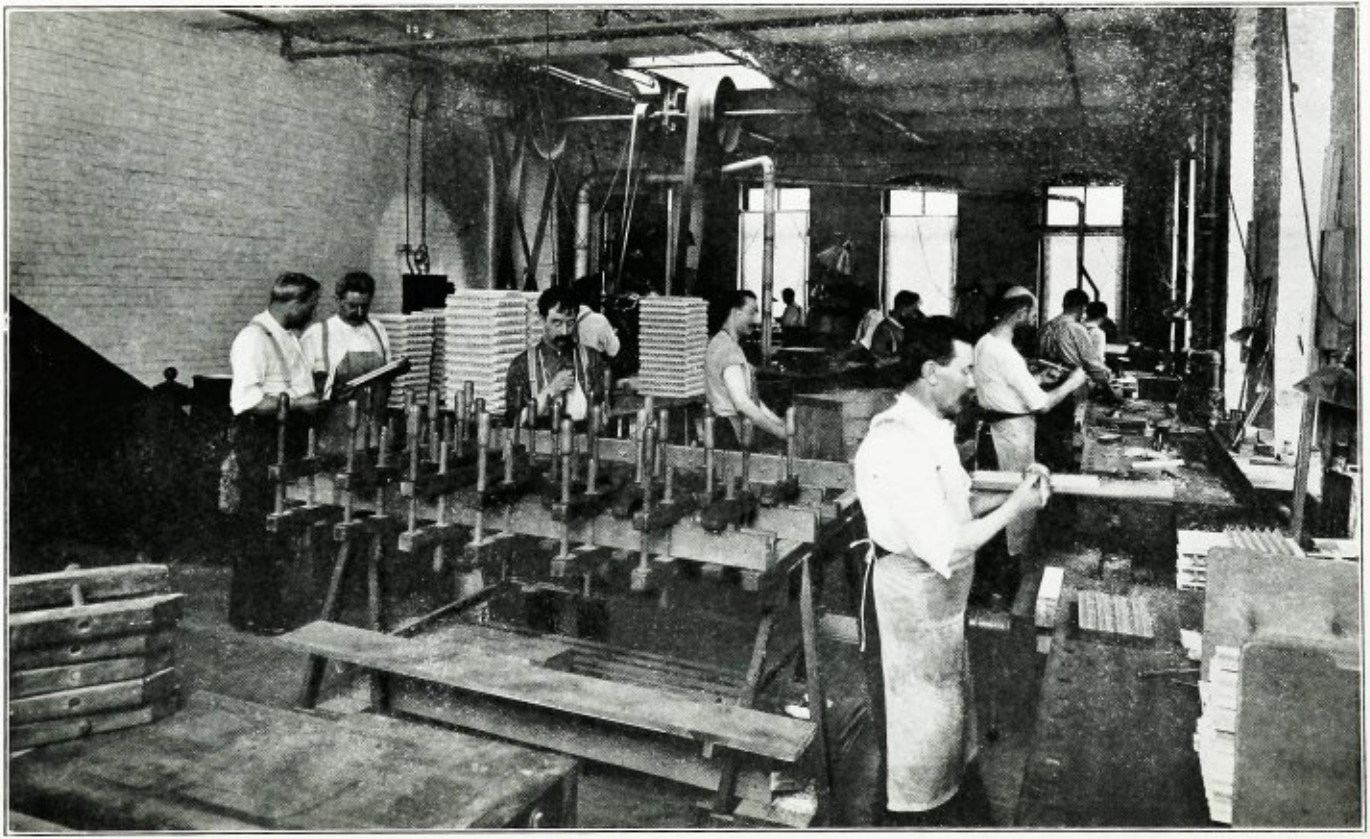
PAPER MOUNTING.— FACTORIES, HOBOKEN, N. J.



KEUFFEL & ESSER CO. NEW YORK.

PHOTO PAPER COATING.—FACTORIES, HOBOKEN, N. J.

KEUFFEL & ESSER CO. NEW YORK.



MAKING OF BLANKS FOR SCALES AND SLIDE RULES.—FACTORIES, HOBOKEN, N. J.



KEUFFEL & ESSER CO. NEW YORK.

FINISHING AND INSPECTING SCALES AND SLIDE RULES—FACTORIES, HOBOKEN, N. J.



PRINTFRAMES

FOR SUNLIGHT.

PRINTFRAMES

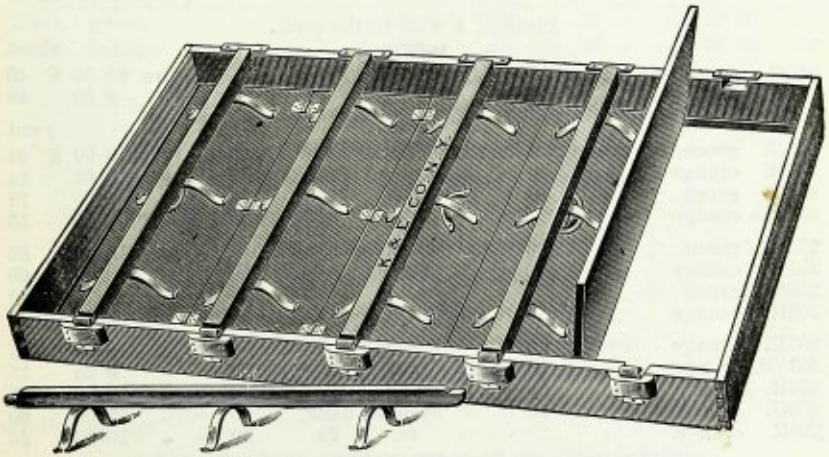
FOR ELECTRIC LIGHT.

PRINTING MACHINES

FOR ELECTRIC LIGHT.

BATH TRAYS

SEE PAGE 235, IN THE SECTION DEVOTED TO DRAFTING ROOM FURNITURE.



STANDARD

(TRADE MARK)

PROFILE AND CROSS SECTION PAPERS AND CLOTHS.



Reduced fac-similes of labels of Standard Profile Papers



We call attention to the quality of the paper we use for our "Standard" Profile and Cross Section Papers, which is a fine tough drawing paper.

Standard Profile and Cross Section Cloths are recommended in preference to mounted Profile paper for outdoor use, as they will stand much rough handling and suffer less in unfavorable weather.

STANDARD PROFILE PAPERS AND CLOTHS.

In sheets and in rolls (continuous).

Please order by number.



Plate A, 4 × 20 to the inch.

						SHEETS.							sheet
250G.	green,	engraving	15×42	in.,	Drawing Paper					quire	$8	50	$ 40
250R.	orange	"	15×42	"	do	do				"	8	50	40
						CONTINUOUS.							yard
253G.	green,	engraving	20	in. wide,	Drawing Paper			50	y'd roll		$10	00	$ 24
253R.	orange	"	20	"	"	do	do	50	"	"	10	00	24
254G.	green	"	10	"	"	do.	do.	50	"	"	6	25	15
254R.	orange	"	10	"	"	do.	do.	50	"	"	6	25	15
255G.	green	"	20	"	"	mounted on muslin,		20	"	"	10	00	60
255R.	orange	"	20	"	"	do.	do.	20	"	"	10	00	60
256G.	green	"	10	"	"	do.	do.	20	"	"	6	75	40
256R.	orange	"	10	"	"	do.	do.	20	"	"	6	75	40
257R.	orange	"	20	"	"	Tracing Paper,		50	"	"	10	00	24
257½R.	orange	"	10	"	"	do.	do.	50	"	"	6	25	15
258R.	orange	"	20	"	"	Tracing Cloth,		20	"	"	12	50	75
259G.	green	"	20	"	"	Columbia Cloth,		20	"	"	10	00	60
259R.	orange	"	20	"	"	do.	do.	20	"	"	10	00	60

All "Standard" Profile Papers bear this trade-mark along the margin.

STANDARD PROFILE PAPERS AND CLOTHS.

(TRADE MARK)

In sheets and in rolls (continuous)

Please order by number.

Plate B, 4 × 30 to the inch.

			SHEETS.					sheet
260G.	green, engraving	13½×42 in.,	Drawing Paper,	. . . .	quire	$8 50	$	40
260R.	orange "	13½×42 "	do.	do.	"	8 50		40
			CONTINUOUS.					yard
263G.	green, engraving	20 in. wide,	Drawing Paper,	. .	50 y'd roll	$10 00	$	24
263R.	orange "	20 " "	do.	do. . .	50 " "	10 00		24
264G.	green "	9 " "	do.	do. . .	50 " "	6 25		15
264R.	orange "	9 " "	do.	do. . .	50 " "	6 25		15
265G.	green "	20 "	" mounted on muslin,		20 " "	10 00		60
265R.	orange "	20 " "	do.	do.	20 " "	10 00		60
266G.	green "	9 " "	do.	do.	20 " "	6 75		40
266R.	orange "	9 " "	do.	do.	20 " "	6 75		40
267R.	orange "	20 "	" Tracing Paper,	. . .	50 " "	10 00		24
267½R.	orange "	9 " "	do.	do. . . .	50 " "	6 25		15
268R.	orange "	20 "	" Tracing Cloth,	. . .	20 " "	12 50		75
269G.	green "	20 "	" Columbia Cloth,	. .	20 " "	10 00		60
269R.	orange "	20 "	" do.	do. . .	20 " "	10 00		60

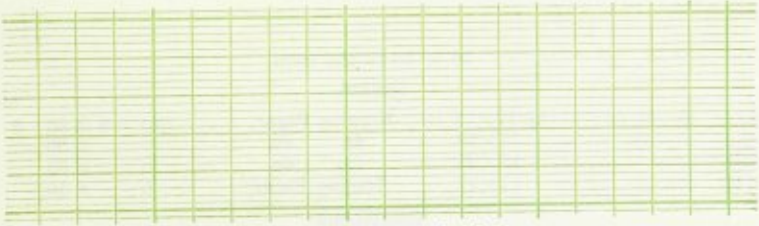


Plate C, 5 × 25 to the inch

			SHEETS ONLY.					
270G.	green, engraving	15 × 42 in.,	Drawing Paper,		quire	$8 50,	sheet $	40
270R.	orange "	15 × 42 "	do.	do.	"	8 50,	"	40

All "Standard" Profile Papers bear this trade mark along the margin.

KEUFFEL & ESSER CO. NEW YORK.

STANDARD CROSS SECTION PAPERS AND CLOTHS,

(TRADE MARK)

In sheets and in rolls (continuous)

Please order by number.

10 × 10 to the inch.

SHEETS.

							sheet
280G.	green, engraving	16 × 20	in.,	Drawing Paper,	quire	$3 50	$ 20
280R.	orange "	16 × 20	"	do do.	"	3 50	20
280B.	blue "	16 × 20	"	do. do.	"	3 50	20
281R.	orange "	16 × 20	"	Tracing Paper,	"	3 50	20

CONTINUOUS.

								yard
283G.	green, engraving	20	in. wide,	Drawing Paper,	50	y'd roll	$10 00	$ 24
283R.	orange "	20	" "	do. do.	50	" "	10 00	24
285G.	green "	20	" "	mounted on muslin,	20	" "	10 00	60
285R.	orange "	20	" "	do. do.	20	" "	10 00	60
287R.	orange "	20	" "	Tracing Paper,	50	" "	10 00	24
288R	orange "	20	" "	Tracing Cloth,	20	" "	12 50	75
289G.	green "	20	" "	Columbia Cloth,	20	" "	10 00	60
289R.	orange "	20	" "	" "	20	" "	10 00	60

16 × 16 to the inch

SHEETS.

							sheet
290G.	green, engraving	17×22	in.,	Drawing Paper,	quire	$ 3 50	$ 20
290R.	orange "	17×22	"	do do.	"	3 50	20
290B.	blue "	17×22	"	do. do.	"	3 50	20
291R.	orange "	17×22	"	Tracing Paper,	"	3 50	20

CONTINUOUS.

								yard
293G.	green, engraving	20	in. wide,	Drawing Paper,	50	y'd roll	$10 00	$ 24
293R.	orange "	20	" "	do. do.	50	" "	10 00	24
295G.	green "	20	" "	mounted on muslin,	20	" "	10 00	60
295R	orange "	20	" "	do. do.	20	" "	10 00	60

All "Standard" Cross Section Papers bear this trade-mark along the margin.

Samples sent on application, or general sample book for 15c.

STANDARD CROSS SECTION PAPERS AND CLOTHS.

(TRADE MARK) In sheets and in rolls (continuous)

Please order by number.

Millimeters.

					SHEETS.					sheet
300G.	green,	engraving	40×50	cm.	wide,	Drawing Paper,	quire	$3 50	$	20
300R.	orange	"	40×50	"	"	do.	do.	"	3 50	20
300B.	blue	"	40×50	"	"	do.	do.	"	3 50	20
301R.	orange	"	40×50	"	"	Tracing	Paper,	"	3 50	20
					CONTINUOUS.					yard
303G.	green,	engraving	50	cm.	wide,	Drawing	Paper,	50 y'd roll	$10 00	24
303R.	orange	"	50	"	"	do.	do.	50 " "	10 00	24
305G.	green	"	50	"	"	mounted on muslin,		20 " "	10 00	60
305R.	orange	"	50	"	"	do.	do.	20 " "	10 00	60
306G.	green	"	75	"	"	Drawing	Paper,	50 " "	21 00	50
306R.	orange	"	75	"	"	do.	do.	50 " "	21 00	50
308G.	green	"	75	"	"	mounted on muslin,		20 " "	17 00	1 00
308R.	orange	"	75	"	"	do.	do.	20 " "	17 00	1 00
307R.	orange	"	50	"	"	Tracing	Paper,	50 " "	10 00	24
307½R.	orange	"	75	"	"	do	do.	50 " "	21 00	50
308½R.	orange	"	50	"	"	Tracing	Cloth,	20 " "	12 50	75

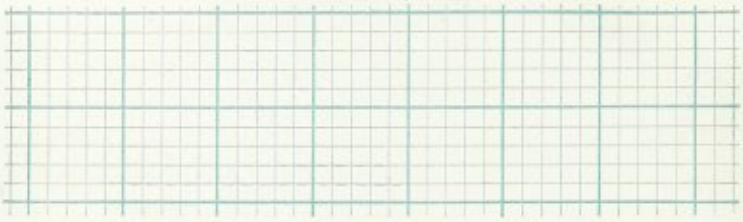
8 × 8 to the inch, fifth lines heavy.

										sheet
310G.	green.	SHEETS	engraving	16¼×21⅝	in.,	Drawing	Paper,	quire	$3 50	$ 20
310R.	orange	"	"	16¼×21⅝	"	do.	do.	"	3 50	20
310B.	blue	"	"	16¼×21⅝	"	do.	do.	"	3 50	20
311R.	orange	"	"	16¼×21⅝	"	Tracing	Paper,	"	3 50	20

All "Standard" Profile and Cross Section Papers bear this trade-mark along the margin.

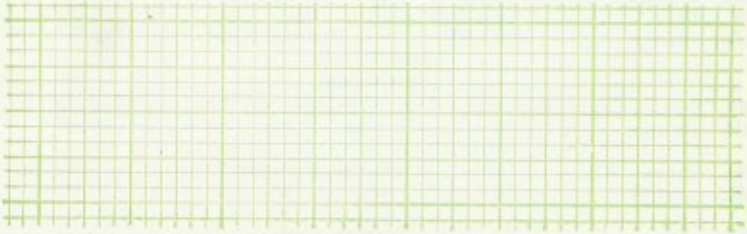
STANDARD CROSS SECTION PAPERS.

Please order by number.



5 × 5 to the half-inch.

						sheet
320G.	green, SHEETS	engraving	16×20 in.,	Drawing Paper,	quire	$3 50	$ 20
320R.	orange "	"	16×20 "	do. do.	"	3 50	20
320B.	blue "	"	16×20 "	do. do.	"	3 50	20
321R.	orange "	"	16×20 "	Tracing Paper,	"	3 50	20



12 × 12 to the inch.

						sheet
322.	green, Sheets,	engraving	16 × 20 in.,	Drawing Paper,	quire $ 3 50	$ 20

All "Standard" Profile and Cross Section Papers bear this trade-mark along the margin.

SIMPLEX CROSS SECTION PAPER.

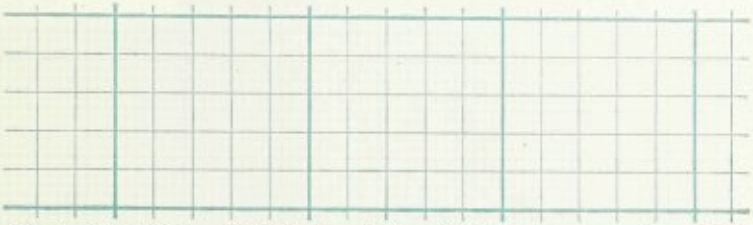
Simplex Cross Section Paper is intended for architectural and mechanical full size detail sketches.

8 × 8 to the inch,

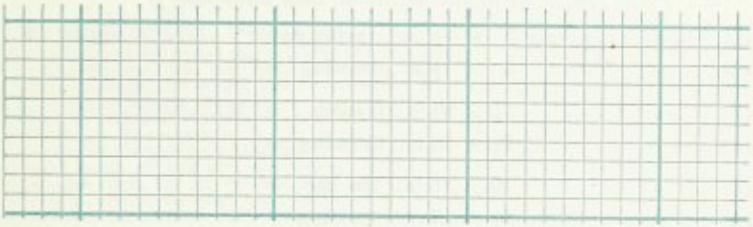
326R.	orange, CONTINUOUS,	engraving 30 in. wide,					
			Simplex Detail Paper,	50 y'd. roll,	$ 6 00	yard	$ 14
326D.	do.	do.	White Detail Paper,	50 y'd. roll,	8 00	"	18

RULED CROSS SECTION PAPERS

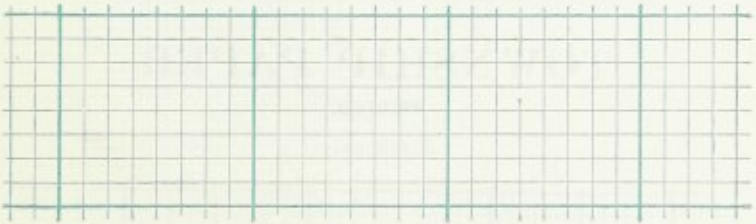
DRAWING PAPER.



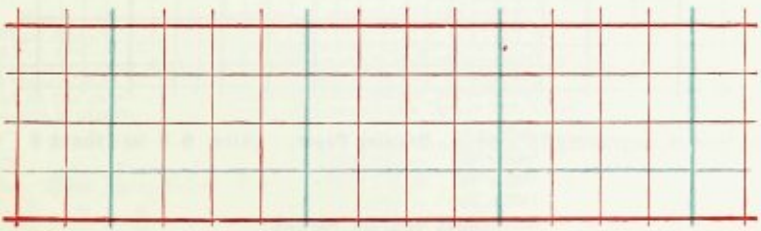
330. Sheets, 16 × 21 in., 5 × 5 to the inch, ruled blue . . . . quire $ 1 00



331. Sheets, 16 × 21 in., 10 × 10 to the inch, ruled blue . . . quire $ 1 00



332. Sheets, 16 × 21 in., 8 × 8 to the inch, ruled blue . . . quire $ 1 00

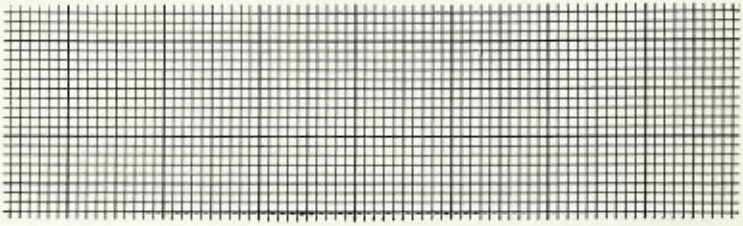


333. Topographical Paper, Sheets, 16 × 21 in., 400 feet to the inch, ruled red and blue . . . . . quire $ 1 00

CONSTRUCTOR'S SKETCH PAPER

PRINTED.

Neutral tint.



10 × 10 to the half-inch, fifth lines heavy.

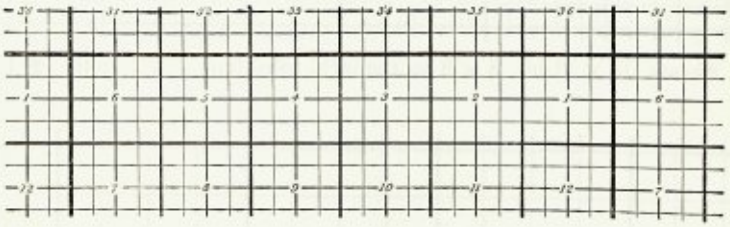
334 A.	Sheets, engraving	5 × 7½ in.,	tracing paper	quire	$ 25
334 B.	" "	5 × 7½ in.,	drawing "	"	25
334 C.	" "	7½ × 10 in.,	tracing "	"	30
334 D.	" "	7½ × 10 in.,	drawing "	"	30
334 E.	" "	10 × 15 in.,	tracing "	"	75
334 F.	" "	10 × 15 in.,	drawing "	"	75

This paper is printed in a **neutral tint**, on which ink or pencil marks stand out well. The lines are indelible, and can be photo-printed.
We recommend it for the use of mechanical engineers, students, &c.

TOWNSHIP PAPER

PRINTED.

Black only.

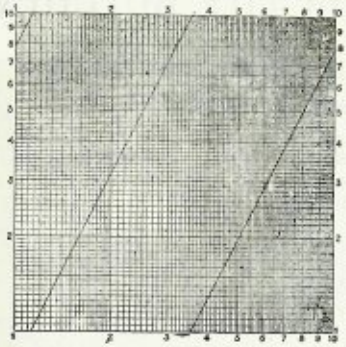


335. Sheets, engraving 15 × 18 in., **Drawing Paper,** quire $ 3 00 sheet $ 15

CROSS SECTION PAPERS

RULED OR PRINTED, OF OTHER DESIGNS THAN HERE LISTED, MADE TO ORDER IN REASONABLE QUANTITIES. PRICES QUOTED ON INQUIRY.

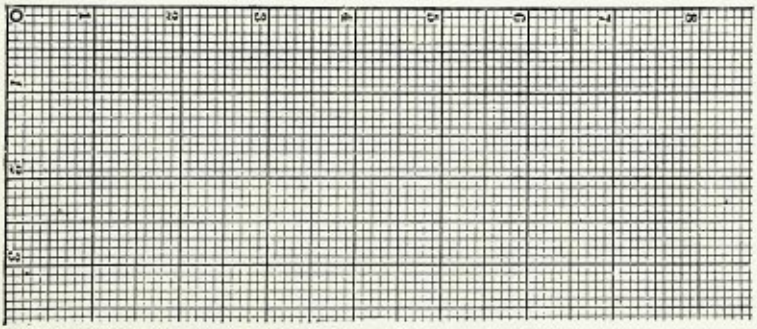
DURAND'S
LOGARITHMIC CROSS SECTION PAPER



336. Sheets, engraving, 10 × 10 in., neutral tint, doz., $ 75; sheet, $ 08

On this paper the scales on each side are logarithmic instead of uniform as in other cross section papers. The numbers and divisions marked are placed at such points that their distances from the origin are proportional to the logarithm of such numbers instead of to the numbers themselves Among the various relationships which may be represented by means of this paper, are: Circumferences and diameters of circles in terms of their radii or diameters, or the inverse; moments of inertia and radii of gyration in terms of a linear dimension, or the inverse; length of pendulum and time of oscillation: powers and roots of any and all indices; weights of a series of bodies of the same substance and form but of varying size, or the inverse, in terms of a linear dimension; sizes of shafts, struts, tie-bars, etc., in terms of varying load, or the inverse; shearing stress, bending moment or deflection of beams or the inverse, in terms of load, etc., etc.

WEBB'S CO-ORDINATE PAPER



Webb's Co-ordinate paper is a convenient and accurate cross-section paper for drafting rooms, technical schools, laboratories, etc. It is printed from accurate engravings in a neutral olive tint which can be photographed or photo-printed. The scale of the rulings is between the English and French (⅝ inches and centimeters) subdivided 10 × 10. The lines of Nos. 337 to 337-1L are numbered in two directions for ready reference to any point on the paper and the sheets are punched for portfolio binding. A table of natural tangents is printed on the margin of some of the larger size sheets, for laying off angles.

337	Best Linen Record Paper,	$8\frac{3}{4} \times 11\frac{1}{4}$ in.,	180×220	squares,	sheet	$ 04
337L	" " " "	$11\frac{3}{8} \times 17\frac{3}{4}$ "	240×350	"	"	07
337-1	Best thin Bond Paper,	$8\frac{3}{4} \times 11\frac{3}{4}$ "	180×220	"	"	04
337-1L	" " " "	$11\frac{3}{8} \times 17\frac{3}{4}$ "	240×350	"	"	07
337-2	" " " "	$8 \times 10\frac{1}{2}$ "	160×220	"	"	03
337-2L	" " " "	$10\frac{1}{2} \times 16$ "	220×330	"	"	06
337-3	Smooth Drawing Paper,	$8 \times 10\frac{1}{2}$ "	160×220	"	"	
				per block of 50 sheets		75

"STANDARD" (Copyrighted)

BLANKS FOR THE BUILDING TRADES.

BLANK FORM SPECIFICATIONS AND REMINDER.

For Frame and Brick Buildings, costing from $500 to $15,000.



The attention of Architects and the Building Trades is called to these **IMPROVED FORMS** of SPECIFICATIONS, CONTRACTS, etc. We call special attention to the fact that this revision of the form of Contract, including Bond and Contractor's Statements, etc., is based upon the revised Lien Laws. The appreciation of the previous editions has induced us to spare no expense for legal and architectural talent to bring the new edition up to date. The fly-leaf "Reminder" is highly appreciated by the profession in general.

338A. STANDARD SPECIFICATIONS.

Single sets . .	(postpaid 28 cents)	$ 25
Dozen sets . . .	(postpaid $2 75)	2 50
100 sets		17 50

The "Standard" Blank Form Specifications consist of fourteen sheets in strong manilla cover, containing the following blank forms:

Preamble, Masons, Cut Stone Plasterers, Carpenters, Painters, Glaziers Plumbers, Gas Fitters, Sewers	Galvanized Iron, Iron, (Structural) Heating, Steam or Hot Water " Furnace, Electric Wiring	Agreement between Owner and Contractor (with Bond) Contractor's Statement Architect's Reminder (on inside of cover)

SEPARATE BLANK FORMS.

338C. BUILDING CONTRACT,
Per 100 $ 1 75, per quire (postpaid 53 cents) $ 50

338D. BUILDING CONTRACT —WITH BOND,
Per 100 $ 1 75, per quire (postpaid 53 cents) $ 50

338F. CONTRACTOR'S STATEMENT,
Per 100 $ 1 75, per quire (postpaid 53 cents) $ 50

338G. MECHANIC'S LIEN NOTICE,
Per 100 $ 1 75, per quire (postpaid 53 cents) $ 50

338H. WAIVER OF LIEN,
Per 100 $ 1 75, per quire (postpaid 53 cents) $ 50

339. ARCHITECT'S CERTIFICATE BOOK,
Per book (100 blanks with stubs). . . . . (postpaid 47 cents) $ 40

DUNHAM'S

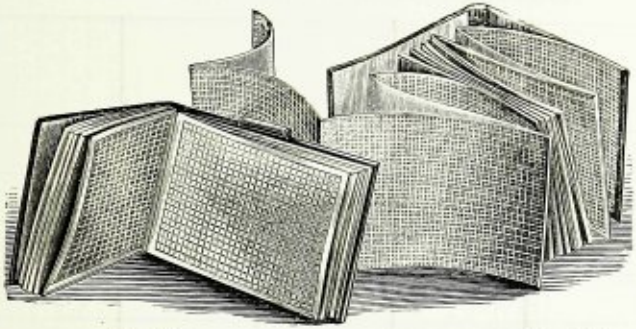
PLAT AND PROFILE BOOKS.

These books are of thin tough paper, bound in flexible morocco, and of a size convenient for the pocket (4¼ × 9½ in.). They contain 36 profile pages, plate B, engraving 3¼ × 7½ in., printed in green, and opposite each profile page, a blank page, with margin 3½ × 8¼ in. for plats, etc. These books contain also some valuable tables.

340. Dunham's Plat and Profile Books . . . . . each $ 1 00

PROFILE AND CROSS SECTION BOOKS AND BLOCKS.

PRINTED IN GREEN.





No. 355. No. 350. No. 350 closed.

PROFILE BOOKS, CONTINUOUS.

Flexible morocco Covers with Flap and Clasp.

Thin, tough paper mounted on muslin and folded like a map, so that these books take the place of the continuous (roll) profile paper.

Each double page contains six thousand feet—a "Section," as generally laid out for the construction of a road.

350.	Plate A. 4 × 20 to the inch, engraving 5 × 7½ in.					
		12	25	50	100	miles,
	each	$ 2 00	3 25	5 25	9 50	
351.	Plate B. 4 × 30 to the inch, engraving 4⅛ × 7½ in.					
		12	25	50	100	miles,
	each	$ 2 00	3 25	5 25	9 50	
351M.	Metric, green, engraving 10 × 20 cm.					
		25	50	100	200	pages,
	each	$ 2 00	3 25	5 25	9 50	

PROFILE BOOKS, NOT CONTINUOUS.

Board Covers, morocco, drawing-paper, both sides printed.

355.	Plate A. 4 × 20 to the inch, engraving 5 × 7½ in.				
		25	50	100	leaves,
	each	$ 1 75	2 25	3 00	
356.	Plate B. 4 × 30 to the inch, engraving 4⅛ × 7½ in.				
		25	50	100	leaves,
	each	$ 1 75	2 25	3 00	
356M.	Metric, engraving 10 × 20 cm.				
		25	50	100	leaves,
	each	$ 1 75	2 25	3 00	

Cross Section Blocks.

357A.	5 × 7 in., 10 × 10 to the inch,	24 sheets	each	$ 75
B.	5 × 7 " 8 × 8 " " "	24 "	"	75
C.	12½ × 20 cm., metric,	24 "	"	75
358A.	7 × 10 in., 10 × 10 " " "	24 "	"	1 25
B.	7 × 10 " 8 × 8 " " "	24 "	"	1 25
C.	20 × 25 cm., metric,	24 "	"	1 25

Cross Section Books.

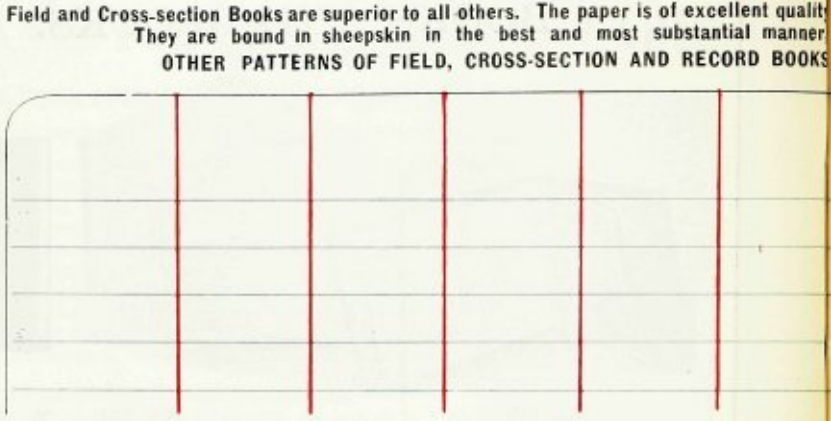
FLEXIBLE COVERS, WITH FLAP AND PENCIL LOOP, 60 LEAVES.

359A.	10 × 10 to the inch, engraving,	4 × 8 in., both sides	each	$ 2 50
B.	8 × 8 " "	4 × 8 " "	"	2 50

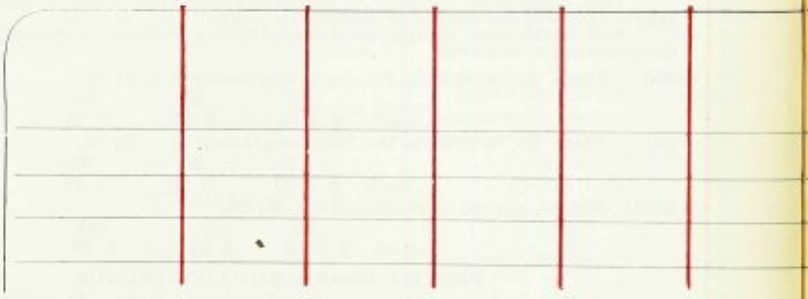
ENGINEER'S

Our Field and Cross-section Books are superior to all others. The paper is of excellent quality. They are bound in sheepskin in the best and most substantial manner.

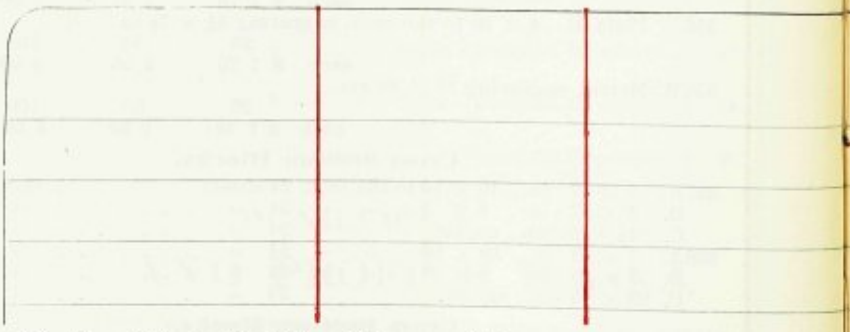
OTHER PATTERNS OF FIELD, CROSS-SECTION AND RECORD BOOKS



360. Field Book, $4\frac{1}{2} \times 7\frac{1}{2}$ in., 80 leaves, right-hand page 8 vertical lines to
361. Field Book, like No. 360 but 60 leaves . . . . . .



363. Mining Transit Book, $4\frac{1}{2} \times 7\frac{1}{4}$ in., 80 leaves, right-hand page 8×8 to the
of arc, and **Hall's Tables** . . . . . .



365. Transit Book, $4\frac{1}{2} \times 7\frac{1}{2}$ in., 80 leaves, **with Keith's and Hall's Tables.** . . . . .
366. Transit Book, like No. 365, but 60 leaves . . . . . .

Keith's Tables (for R. R. Engineers) consist of: Minutes in decimals of a degree, Inches in decimals of and Externals to a 1° curve, Table of Deflections for Sub-chords, General Curve Formulas, Table of Natural Sines

Hall's Tables for Excavations and Embankments comprise

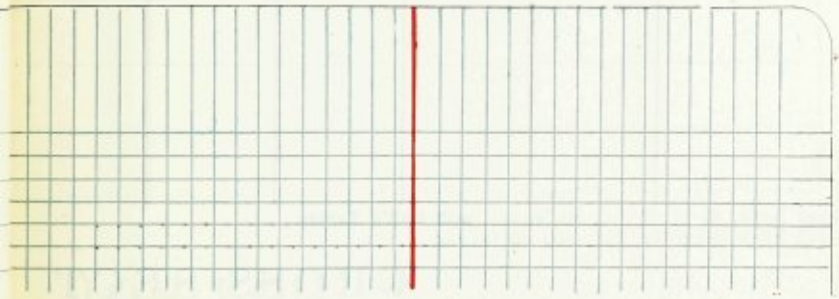
FIELD BOOKS.

and good weight, taking pencil or ink, and the rulings are correctly spaced and weather-proof. and have round corners, board covers and round back, so as to open flat.

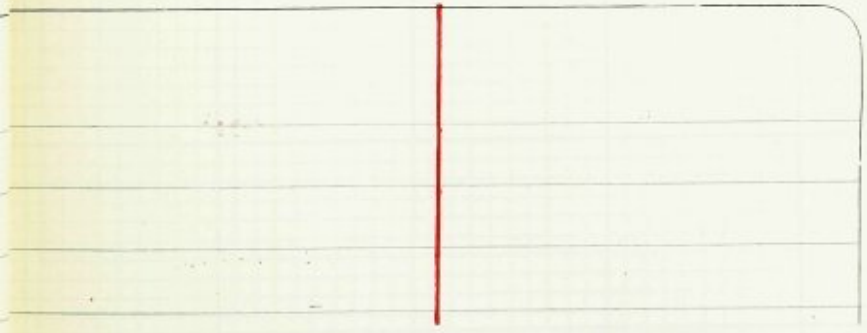
MADE TO ORDER IN LOTS OF NOT LESS THAN 6 DOZ. OF A KIND.



the inch, with Keith's and Hall's Tables . . . . . each $ 65 per doz. $ 6 50
. . . . . " 55 " 5 50



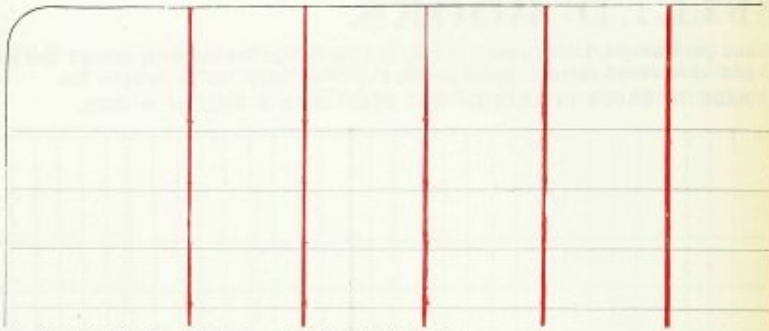
inch, with Tables of Natural Trigonometrical Ratios for each 10 minutes
. . . . . each $ 65 per doz. $ 6 50



. . . . . each $ 65 per doz. $ 6 50
. . . . . " 55 " 5 50

a foot. Radii, Ordinates and Deflections, Tangents and Externals to a 1° curve, Corrections for table of Tangents to every 10 minutes of arc, Table of Natural Tangents to every 10 minutes of arc.

Roadway 18 feet, Slope 1 : 1 and Roadway 14 feet Slope 1½ to 1.

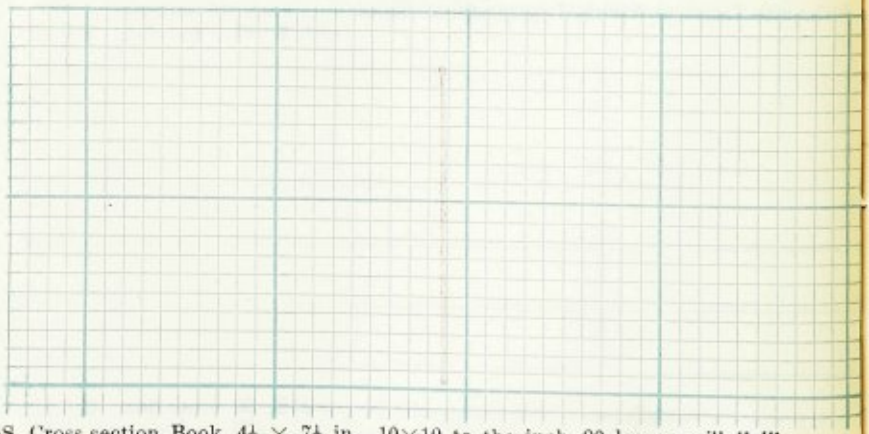


370. Level Book, 4 × 6½ in., 80 leaves, **with Hall's Tables** . . . . . .
371. Level Book, like No. 370, but 60 leaves . . . . . .



373. Level book, 4½ × 7¼ in., 80 leaves, **with Hall's Tables** . . . . . .
374. Level book, like No. 373, but 60 leaves . . . . . .

CROSS SECT



375S. Cross-section Book, 4½ × 7½ in., 10×10 to the inch, 80 leaves, **with Hall's**
375. Cross-section Book, 5½ × 7½ in., 10×10 to the inch, 80 leaves, **with Hall's**
376. Cross-section Book, 6½ × 8½ in., 10×10 to the inch, 80 leaves, **with Hall's**

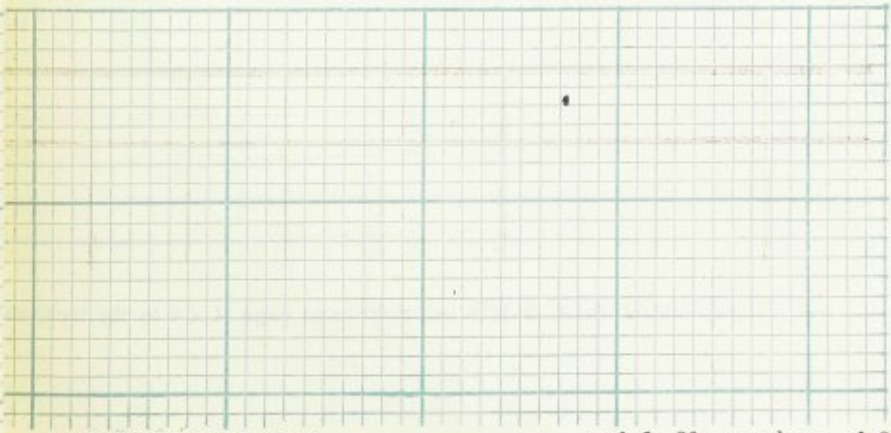


. . . . . each $ 55 per doz. $ 5 50
. . . . . " 50 " 5 00



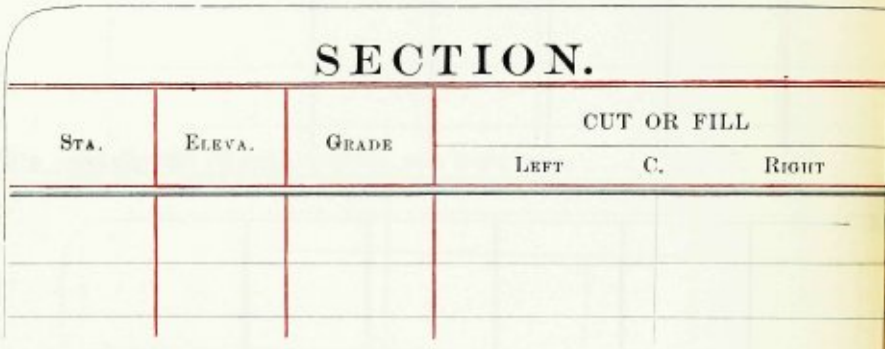
. . . . . each $ 60 per doz. $ 6 00
. . . . . " 55 " 5 50

ION BOOKS.

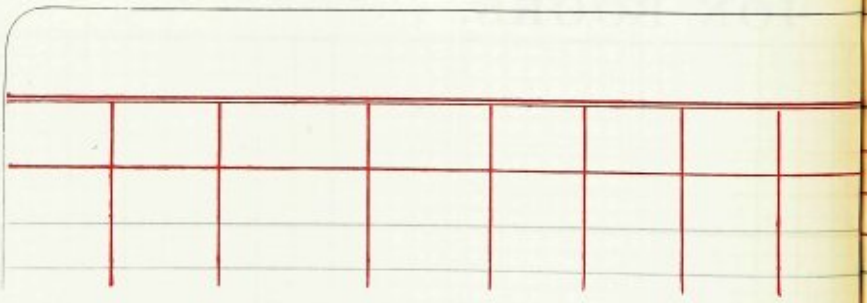


Tables, printed in blue . . . . . each $ 80 per dozen $ 8 00
" " " " . . . . . " 90 " " 9 00
" " " " . . . . . " 1 15 " " 11 50

Roadway 18 feet, Slope 1:1 and Roadway 14 feet, Slope 1½ to 1.



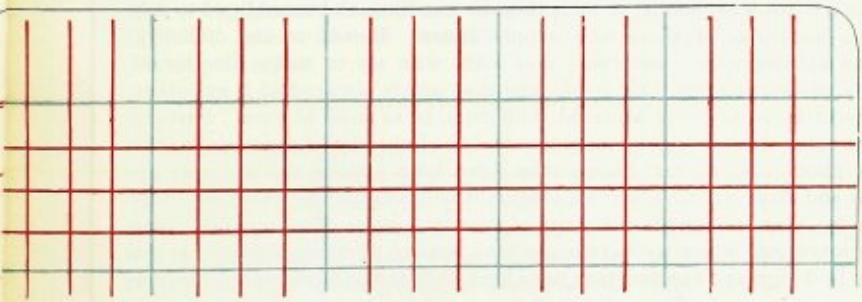
380. Earthworks Book, 5 × 7¾ in., 80 leaves, with Keith's and Hall's Tables



385. Topographical Book, 5 × 8 in., right-hand page 4 × 4 to the inch, 80

AREAS		Cubic Yds.		Remarks
EXCAVATION	Embankment	Excav.	Embank.	

(see page 36) . . . . . each $ 1 00 per dozen $ 10 00



eaves . . . . . each $ 1 25 per dozen $ 12 50

HOW TO SELECT

DRAWING INSTRUMENTS.

Since the founding of our house (in 1867) we have sought to introduce progressively better drawing instruments in place of the often inefficient and unpractical instruments then offered. We described them in a manner until then unknown, we explained their advantages by word, pen and demonstration, and thus created for them a demand much greater than there had been previously for even the cheapest kinds. Our close study of the requirements and wishes of our patrons and their advice and suggestions, coupled with our intimate and expert practical and theoretical knowledge of drawing instruments, has led to the production of our

PARAGON INSTRUMENTS,

which are specifically and emphatically the

AMERICAN PATTERN

of instruments, unlike any used elsewhere and, we venture to say, of superior construction and design.

Unfortunately for us, the quality of instruments, which is obvious and evident when they are in actual use, can be determined from mere inspection of the goods by but very few experts, so that dealers, with rare exceptions, are unable to tell just what quality of tools they are handling, and are obliged to rely upon the assertions of those who supply them. To add to the difficulty, importers and dealers are sometimes met with, who try to make illegitimate profits by misrepresenting their goods, and they nearly always find it expedient to represent them as being identical with ours, or as good as ours. Furthermore our cuts, illustrating our instruments, have been copied again and again, even by photo-process, our descriptions have been pirated and the very appearance and arrangement of our Catalogue, which was unique when we originated it, has been imitated to the verge of counterfeiting. The several important improvements which we have made from time to time, representing actual progress in design and construction, have been imitated in outward appearance, but not in scope and effect, mainly because we have protected the essential features by letters patent.

These several considerations have induced us, in our own interest and for the protection of our patrons, to place a special quality mark, the word **Paragon** on every one of our **best** instruments, besides stamping them with our name or its initials or K & E.

Our position as the leading house in our line, and the nature of our business, which has grown to such great proportions, embracing large domestic and foreign markets, require us to make and keep in stock all kinds of instruments, —good, fair and ordinary, but we include *in our Catalogue* only what we can recommend, except the

LOW-PRICED INSTRUMENTS

No. 1006S to 1012H, which are unsuitable for professional work, and are intended for beginners only, thus, by reason of their moderate price filling a recognized want. With this exception all instruments described and illustrated in this catalogue are good, *better*, and **best.** Under such circumstances we can have no object in misrepresenting any particular style or grade of instruments; on the contrary, we describe all accurately, so that it may be at once apparent to each buyer which grade of instruments is best adapted to his particular requirements.

It is, however, advisable and in the end more economical, to buy the best instruments one can afford. **Good instruments will meet all requirements,** and the saving of time and the satisfaction obtained by their use, the better work they will do, and their permanence will amply justify the paying of higher prices. **Instruments, which on account of their inferior quality prove unfit for the intended work, are absolutely worthless to the purchaser,** who will be obliged to replace them by better ones.

MATERIAL.

The metals usually employed for drawing instruments are German silver of varying quality, and steel or iron. While it is evident that the steel must be of good quality and properly tempered, a few remarks about the German silver seem more called for. Its quality depends not alone on the proportions of the ingredients of the alloy, but also on the density and hardness of the metal, which is usually obtained by hammering or swaging the casting, either on an anvil or in a steel die. To have German silver, however, in its best form and at its greatest density and elasticity, it must be *rolled*, (not cast); we therefore make our best (**PARAGON**) instruments of rolled (sheet or plate) German silver.

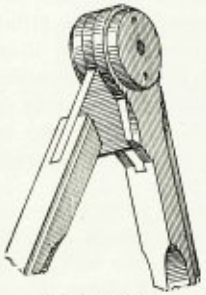
FINISH.

The finish of the finest mathematical instruments is so peculiar, that it is often referred to as "mathematical instrument finish", without any attempt at describing it. It is the *only* finish which leaves perfection of workmanship and form visible, because it hides no fault nor flaw, and thus it represents the acme of mechanical beauty. The finish produced by buffing drawing instruments which pretend to be of fine quality, is a barbarism which is excusable only when the obscuring effect of the glossy buffing is necessary to save appearances or to lessen the cost of production. Nobody who can appreciate mechanical beauty will consider it a proper finish, and the polished surfaces and partly effaced edges and angles produced by the buffing wheel, give instruments a glossy and cheap appearance which catches the eye of only those who are totally inexperienced.

The most important instruments are Compasses, (including Dividers), Ruling Pens and Bows, which we shall therefore describe in detail.

COMPASSES.

The most essential part of a pair of Compasses is the head, which forms the joint. There are two kinds of joints recognized: the **tongue joint**, in which the head of one leg has a tongue, generally of steel, which moves between two lugs on the other leg; and the **pivot joint**.



Tongue joint.



Tongue joint with handle (No. 9020, etc.)



Pivot joint.



Esser's Patent Pivot joint.

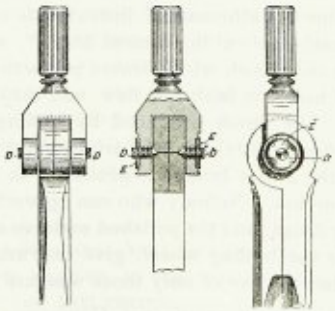
ESSER'S PATENT PIVOT JOINT

(Nos. 600, etc., page 82.)

combines all the advantages of the ordinary pivot joint with some additional ones.

In the ordinary pivot joint the head of each leg is made in the form of a disc and the two discs are held in apposition in a brace (or fork) by means of two pivot-screws. The brace is provided with a handle, because its shape and bulk forbid holding the compass by its head in the usual manner. The two pivot-screws are held or locked by two slender screws passing through the free ends of the brace and *impinging against the thread of the pivots*. The risk of breaking the small set screws, the *certainty of their gradually spoiling the thread of the pivot-screws* and their liability to collect dust, are disadvantages of the ordinary pivot joint.

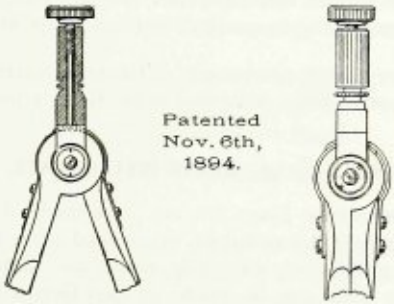
The essential features of Esser's Patent pivot joint, *which is applied only* to **PARAGON** *instruments*, are the following:



Esser's Patent Pivot Joint. (Patented, March 14 and 28, 1893.)

The pivots, *D*, *D*, as shown in the figure, are held securely by means of steel *lock nuts E*, *E*, which fit nicely in circular recesses in the arms of the brace (fork), and which are tapped to correspond to the screw threads of the pivots. By the sinking of the lock-nuts in the recesses as shown, the joint presents a well-proportioned and beautiful appearance, all risk of injuring the screw thread of the pivots or of breaking the set screws is avoided, there is no place for collecting dust, and the lock nuts are much *more efficient* than the small set screws. The re-adjusting of this joint is as simple as that of the old style. To insure proper adjustment of our Paragon instruments, we will re-adjust them at any time without charge.

ESSER'S PATENT LOCKING DEVICE.



(No. 613 etc., page 86).

This pivot joint admits of applying a very practical device for locking or clamping the joint in any position.

This is accomplished by means of two steel bands, each passing up from one of the legs to which it is attached, around the head and well beyond the median line, so that in the median line these bands overlap in opposite directions. At this point they can be firmly locked against the compass head and each other by a screw bolt operated by a **milled head** at its upper end, beyond the handle.

Where the same opening of dividers or compasses is to be used repeatedly, or where great accuracy is required, this attachment will be found of value. It adds practically nothing to the bulk of the instrument, nor does it in any way interfere with any of its other uses, nor detract from its appearance.

We beg to call special attention to the fact, that Esser's Patent Pivot Joint and the Locking Device have been very closely imitated in their outward appearance. The essential and vital parts of our improvements are protected by letters patent, and imitations must therefore either be infringements liable to prosecution, or they copy the appearance only, without the essential improvements.

Another feature to observe about a compass is its

WEIGHT AND SHAPE.

It should always be heavy enough to be absolutely rigid during all manipulations to which it is properly subjected, and the metal should be so distributed that it will nowhere add to the weight without increasing the rigidity or stiffness. The quantity of metal, irrespective of its distribution, is determined by the hardness (toughness) of the German silver; the harder and tougher it is, the less of it is required.

PARAGON INSTRUMENTS.

Paragon Instruments, (page 53, etc.) are cut out of sheets of best **rolled** German Silver of the greatest strength and density; the steel parts are of finest steel especially treated and tempered for the purpose. These instruments are to-day unsurpassed in quality, workmanship, and finish.

We list and carry a full assortment of Paragon instruments with tongue joint, with Esser's patent pivot joint and with Esser's patent locking device.

"KEY" () BRAND INSTRUMENTS.

Key Brand Instruments, (page 108, etc.) are made of cast German silver of a special alloy which is hammered or swaged after casting, and of fine tempered steel. They are very carefully made and finished and represent the best instruments that can be made of cast German silver. They are superior to any others made of similar material.

We list and carry a full assortment of "Key" Brand Instruments with **tongue joint** (page 108, etc.) and with **plain pivot joint** (page 122, etc.).

They should not be confounded with the cheaper grades of pivot joint instruments which resemble ours in appearance only. "Key" Brand Instruments will compare favorably with most others offered as finest quality and highest grade.

"ARROW" () BRAND INSTRUMENTS.

We have retained the well-known **Arrow** brand ruling pens (page 137) but have met popular demand by substituting

EXCELSIOR INSTRUMENTS

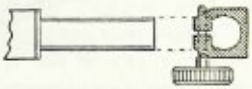
compasses and dividers (page 142) which have tongue joint **with handle** (see page 44) for the corresponding Arrow brand instruments formerly listed under Nos. 900 to 961.

Instruments sold at a lower price than the Excelsior Instruments must necessarily be soft castings and cannot be recommended for professional use.

An important feature about a compass is the manner of inserting the several points (parts) belonging to it. Here, as is generally the case, most makers recommend what costs least and is easiest to make. In the following illustrations are shown the principal patterns for shafts of insertion pieces; the long and strong pentagonal shaft, the shaft with clamping socket and the round shaft with steel feather and spring socket.



Pentagonal Shaft.



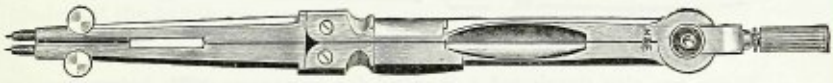
Shaft with Clamping Socket.

The pentagonal shaft should engage in a socket of the same shape and size and be held there by a screw which presses the beveled part into the corresponding V groove in the socket, thus keeping it in perfect alignment.



Round Shaft with Steel Feather.

The round shaft is held by the spring of the socket and kept in alignment by a steel feather. This construction, if properly made, offers many advantages. It is inserted or removed quicker than parts held by thumbscrew, there are no screws to wear out or be lost, no screwheads to obstruct the sight, and the instrument can be made lighter and of more graceful shape.

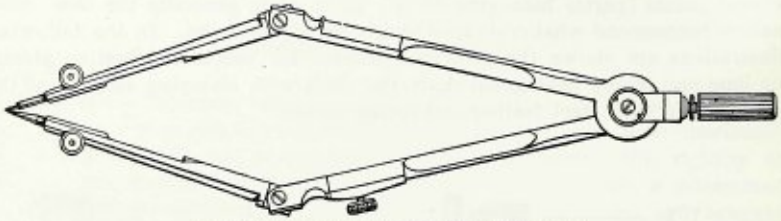


Compass with round-shaft point, (no thumbscrew).



Compass with point with pentagonal shaft.

The round shaft for insertion pieces requires the most precise workmanship and the very best material to give permanent satisfaction. Both of these conditions obtain in our Paragon Instruments to which only we apply this construction. Compasses with round shaft and steel feather are listed under Nos. 603 R and following (page 82).



Compass in position for testing alignment.

All joints in a compass and its parts should move in the same plane. This is readily tested by inserting the several parts and then bending them as shown in the cut above, when their points should meet. This is also a test for the alignment of the shank in the socket, and every good instrument should stand this test.



Compasses with fixed needle point.

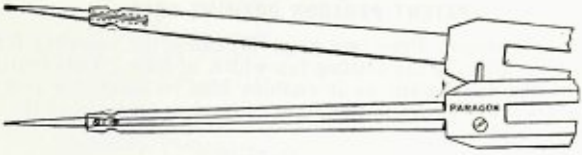
There is a preference for compasses with fixed needle point. The argument is that, as nearly all the better sets have separate dividers, the steel legs of the compasses are superfluous, because they come into use only when the compasses are used as dividers, and must be removed and replaced by other parts before the compass can be used as such.



Compasses with hairspring.

There has also developed a demand for compasses with hairspring (as formerly applied only to dividers), and as some draughtsmen prefer making minute adjustments with the Hairspring to making them by careful setting of the main joint, this feature is finding favor. We therefore list and carry many patterns of *compasses* with hairspring.

To sum up, compasses should be of good material of proper hardness and of weight proportionate to the hardness of the metal, to insure stiffness in all positions; the metal should be judiciously distributed, all joints should move in one plane, the shanks of the insertion pieces should be properly made and the workmanship should be perfect throughout. The finish should be put on with care, and **the instruments should not have a glossy polish,** as this substitute for the proper finish is resorted to only to hide defects or because it is cheaper.



Adjustable points of Paragon Proportional Dividers.

We draw attention to the improvement in the Paragon Proportional Dividers No. 435 to No. 440, (page 58). All of them have **steel legs** and movable (adjustable) round steel points held by a set screw, permitting of ready setting to the original length, in case of wear or accidental breaking.

DRAWING OR RULING PENS.

The drawing pen is that instrument of a Draftsman's outfit which is in most constant use, and in which defects in quality or construction would therefore most readily become apparent.

Drawing pens are generally of one of two types: with a joint to allow the blades to be thrown apart for cleaning and setting, or without a joint.



Pen with joint.

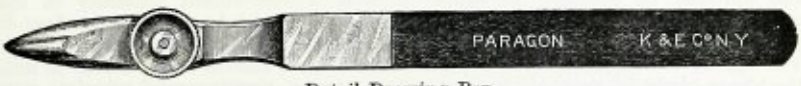


Pen without joint.

The joint should, of course, be very carefully made, otherwise the upper blade becomes shaky and the pen consequently useless. Many fine pens with joint have also a pin set in the ferule, which is exposed by unscrewing the blades off the handle and is used for marking points for which a pencil would be too coarse.



Pens without a joint, but in which the upper blade is made to spring open, possess many of the advantages of a pen with a good joint. A good pen without a joint is far preferable to an inferior one with a joint, and it costs less.

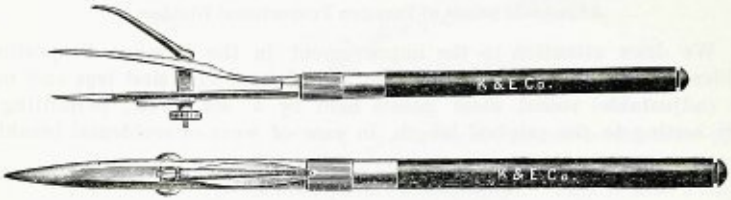


Detail Drawing Pen.

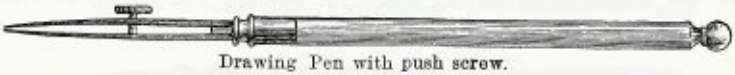
The **Detail Drawing Pen** is a modification of this style of pen. The wide blades hold much ink, so that long lines can be drawn without re-filling the pen.

PATENT PARAGON DRAWING PENS.

The Patent Paragon Pens (see page 73) can after opening for cleaning, be closed without altering the setting for width of line. This feature is much appreciated by the draftsman, as it enables him to clean the pen while he is engaged on a drawing, with the certainty of having all lines of the drawing of exactly uniform width.



The upper blade of these pens springs open when it is released and the setting for width of line is regulated by the thumbscrew attached to a steel lug which passes through the spring blade and engages an eccentric which holds or releases the spring blade.



Drawing Pen with push screw.

Pens for close ruling (hatching pens) are made also with push screw, *i. e.*, the spring of the blades holds their points together and the thumb screw, which applies against the lower (under) blade, forces them apart. Hatching pens have firm blades, and generally 2 or 3 pairs of blades with points of different taper are furnished with one handle.



Drawing Pen without thumbscrew.

Another manner of adjustment is by a wedge between the blades, which separates or releases them as it is moved down or up by a rod with a thumbnut at the end of the handle (No. 695, page 107). In such pens there is no danger of the thumbscrew displacing the blades side-ways, as might happen from bending of the screw or uneven wear of the thread. The absence of the thumbscrew prevents obstruction to sight in crowded drawings.

A good drawing pen should be made of steel properly tempered, neither too soft, nor hardened to brittleness. The nibs should be accurately set, both of the same length, and both equally firm when in contact with the drawing paper. The point should be shaped to be fine enough to admit of absolute control of the contact of the pen in starting and ending lines, but otherwise as broad and rounded as possible, in order to hold a convenient quantity of ink without dropping it. The lower (under) blade should be sufficiently firm to prevent approach of the blades of the pen when using it against a straightedge. The spring of the pen, which separates the blades, should be sufficient to hold the upper blade in its position, but not so strong that it would interfere with easy adjustment by the thumbscrew. The thread of the thumbscrew must be deeply and accurately cut, so as not to strip.

Highly tempered steel is necessarily more brittle than a softer steel and if a pen should be injured by a fall, it would not be an indication of inferior steel.

SPRING BOWS.

These were originally developed from the shape of compasses, but later the demand for small sizes made changes in the patterns desirable and now bows are made entirely of steel, and symmetrical, as shown here:



No. 481.

What is said in the description of ruling pens about the necessity of a sufficiently stiff spring and about the relation between spring-pressure and thumbscrew, applies to bows of spring steel just as well as to blades of ruling pens.

In the coarse adjustment of bows, the spring should be compressed by the fingers while setting the thumbscrew, to avoid wear of the thread.

For those who use a bow instrument much, the latest form of thumbscrew will be a great convenience:



No. 486.

It will be seen from the cut that two threads, a right and a left, engaging in swiveling sockets are moved by one central thumbscrew. The main difference between a single thread and a right and left-thread bow is, that in the latter the stiffness of the spring bow does not depend on the strength of the spring, but both legs of the bow are held rigidly by the screw, without depending on counter-pressure from the spring. As two threads engage simultaneously, the motion is double that of a single thread and it therefore requires only one-half the time. Such bows are listed under numbers 485, 740 and 9045 C. (pages 66, 113, 149).

The two bows below represent another useful pattern, which is adapted especially for drawing very small circles or arcs.



No. 452.



No. 453.

In both the pen draws by its weight, but in number 452 the central pin revolves with the instrument, while in number 453 the central pin is stationary and the pen revolves about it. The latter has the advantage, that the paper will not be pierced, even if many circles are drawn from one centre. It is the best spring bow for drawing very small circles or arcs. (See pages 61, 115, 148).

The instruments which we have described, compasses, ruling pens and bows, practically cover the field. What has been said of compasses and dividers applies equally to proportional, whole-and-half, pocket and three-legged dividers and to beam compasses, while the remarks about pens practically include border, curve, and railroad pens, and of course the pen points of compasses. The various approved and recognized styles of all these drawing instruments are so well illustrated and so fully described in our Catalogue that it would be needless to say more about them here.

In conclusion we would emphasize that our **Paragon Instruments** are indeed all that their name implies, which is proven also by the fact that even the instruments of Swiss manufacture, which in former years held the American market, had to give way to them and have lately been entirely remodeled, so that they are now largely imitations of our **Paragon Instruments,** as far as our several patents and copyrights will permit.

Our **Paragon Instruments** are essentially the **American Pattern**, produced and introduced by us.

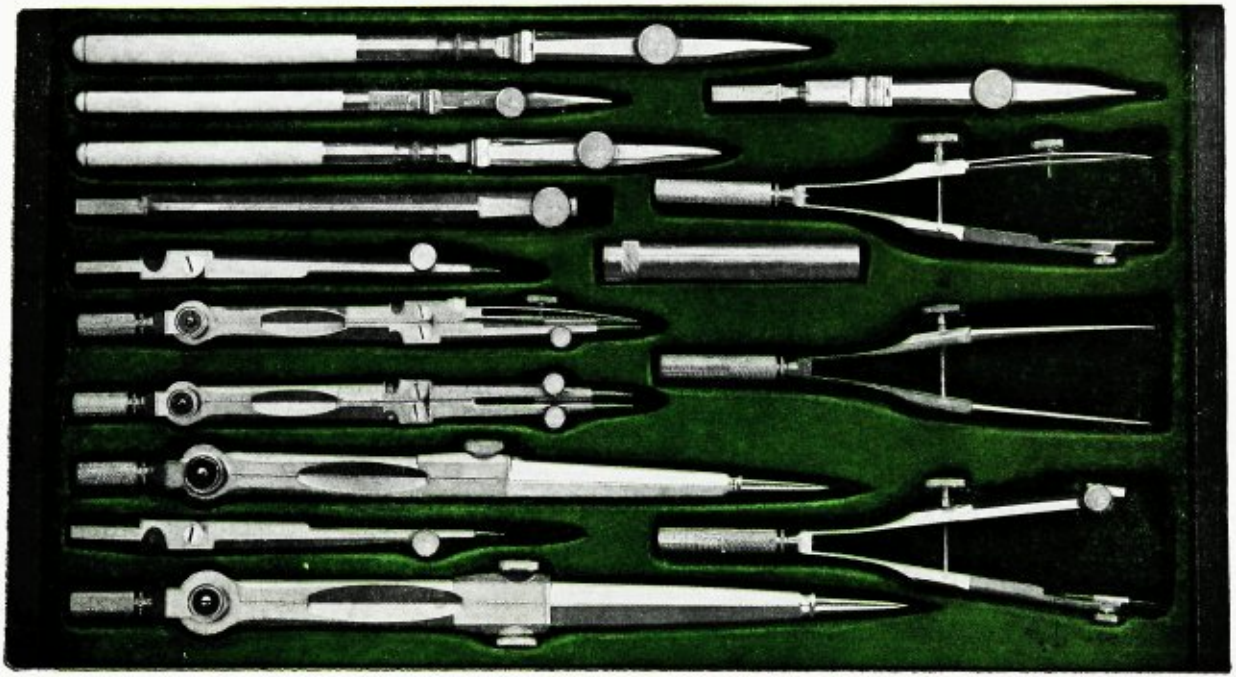
In order to facilitate selection, we recapitulate the grouping in our catalogue of the several kinds of instruments:

Paragon, tongue-joint,	No. 401	and	following,	page 53
Paragon patent pivot-joint,	600	"	"	" 82
Paragon (special pens),	690	"	"	" 107
English, sector-joint,	640	"	"	" 104
Key brand, tongue-joint,	700	"	"	" 108
Key brand, pivot-joint,	831	"	"	" 122
Arrow brand pens,	919	"	"	" 137
Plain Proportional Dividers,	1085	"	"	" 138
Excelsior Instruments	9020	"	"	" 142
Beginners' Instruments (nickel-plated),	1006S	"	"	" 150

We publish a separate Catalogue of Instruments for Schools, etc.

REPAIRING OF DRAWING INSTRUMENTS.

The proper repairing of Drawing Instruments requires skill and experience. We are prepared to repair any of our instruments in the best possible manner at a reasonable charge.



PARAGON INSTRUMENTS

PARAGON INSTRUMENTS

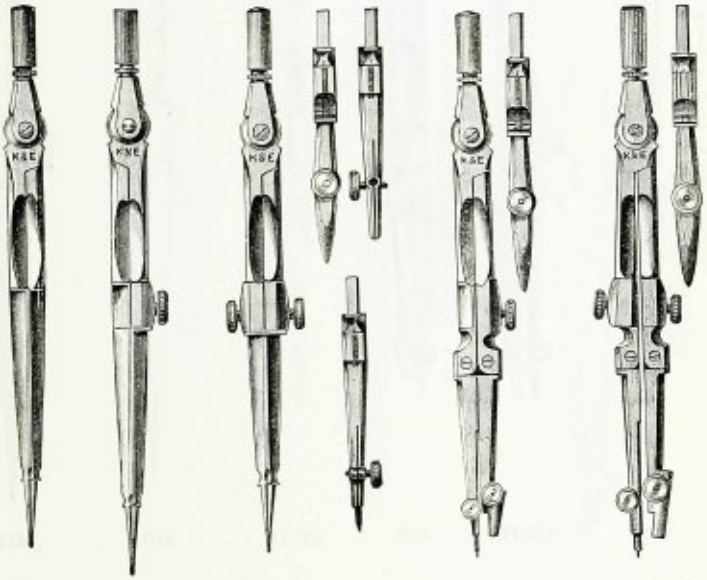
of best Rolled German Silver and Finest Steel.

THE VERY BEST INSTRUMENTS MADE.

(For description see page 42.)

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

Copyright, 1887, by Keuffel & Esser.



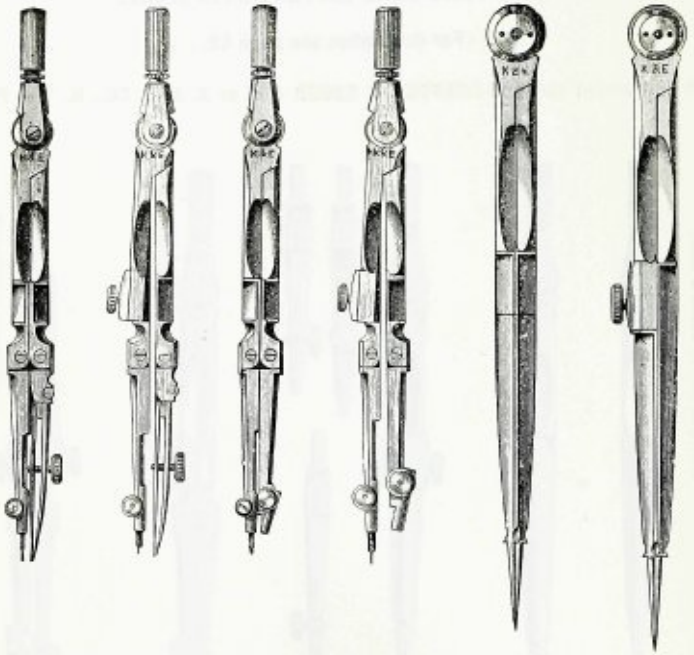
No. 401. 402. 403. 404. 404 H.

401.	Plain Dividers 3½ in. with Handle	each	$ 2 00
402.	Hairspring Dividers, 3½ in., with Handle	"	2 60
403.	Compasses, 3½ in., with 2 Steel Points, Pen, Pencil and Needle Point.	"	6 00
404.	do. 3½ " " fixed Needle Point, Pen and Pencil Point	"	5 25
404 H.	do. 3½ " like No. 404, but with Hairspring . .	"	6 25

For Paragon Instruments with Patent Pivot-joint see page 82.

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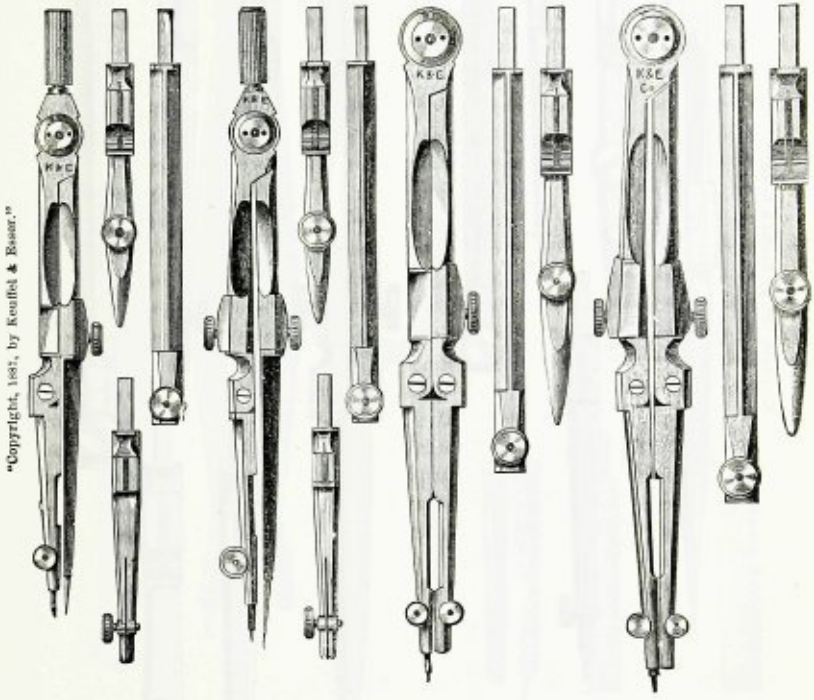


406. 406 H. 407. 407 H. 410. 412.

406.	Compasses, 3½ in., with fixed Needle and Pen Point . .	each	$ 3 50
406 H.	do. 3½ " like No. 406, but with Hairspring . .	"	4 50
407.	do. 3½ " with fixed Needle and Pencil Point .	"	3 50
407 H.	do. 3½ " like No. 407, but with Hairspring . .	"	4 50
410.	Plain Dividers, 5 in.	"	2 20
411.	do. do. 6 "	"	2 50
412.	Hairspring Dividers, 5 in.	"	3 00
413.	do. do. 6 "	"	3 30

For Paragon Instruments with Patent Pivot Joint see page 82.

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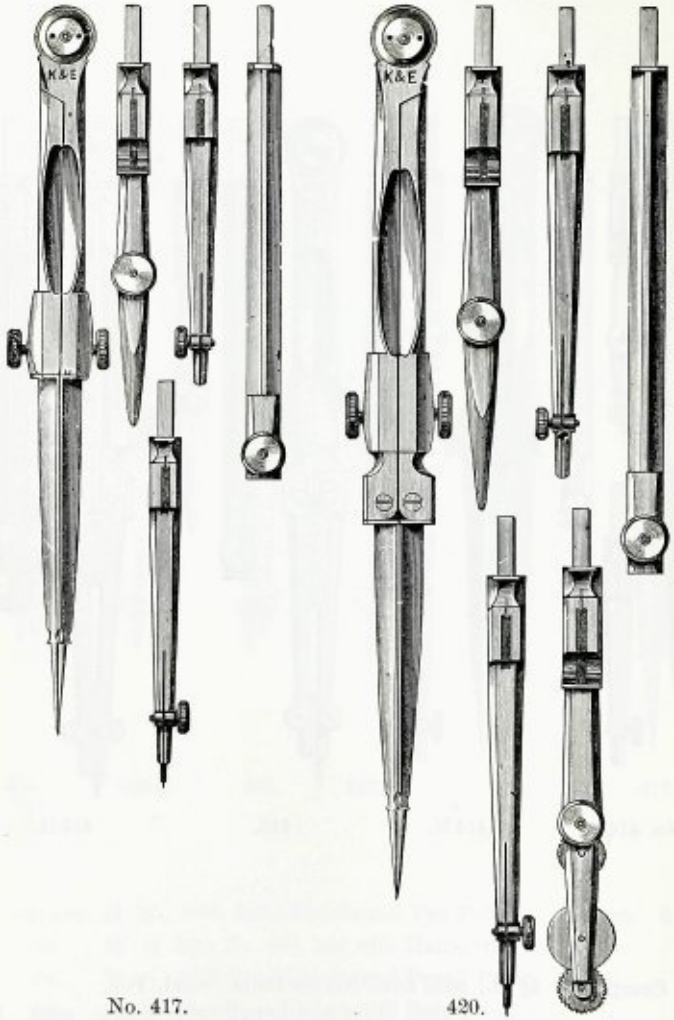
No. 414. 414 H. 415. 415 H.

414.	Compasses	4½ in.,	with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar .	each	$ 7 25
414 H.	do.	4½ "	like No. 414, but with Hairspring .	"	8 25
415.	do.	5½ "	with fixed Needle Point, Pen, Pencil Point and Lengthening Bar	"	7 00
415 H.	do.	5½ "	like No. 415, but with Hairspring .	"	8 00

For Paragon Instruments with Patent Pivot Joint see page 82.

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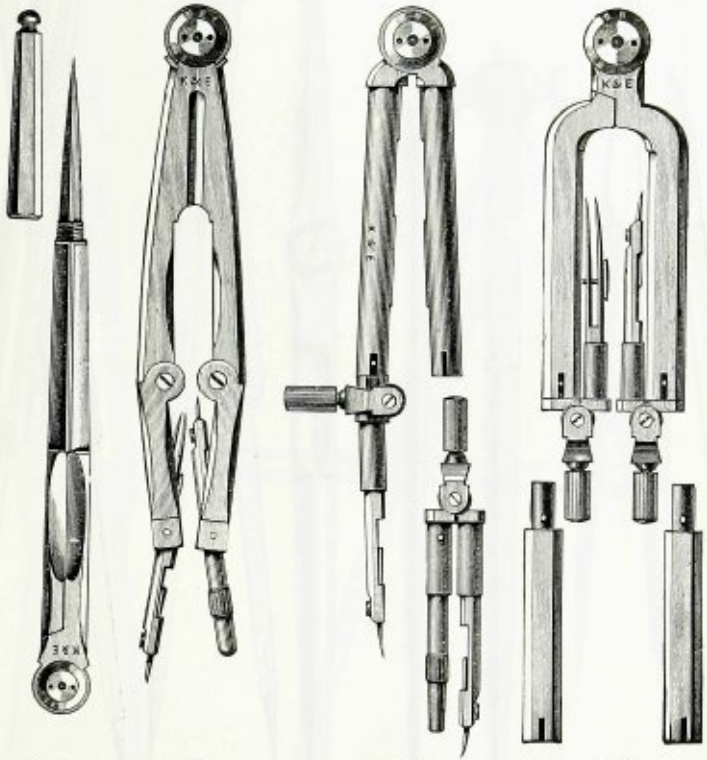
No. 417. 420.

417.	Compasses,	6	in., with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar	each	$ 8 00
418.	do.	6½	" with 2 Steel Points with Joint, Pen, Pencil, Needle Point and Lengthening Bar	"	9 25
419.	do.	7	" with 2 Steel Points with Joint, Pen, Pencil, Needle Point, Lengthening Bar and Dotting Pen	"	10 75
420.	do.	7	" like No. 419, but Dotting Pen with 6 Wheels	"	12 00

For Paragon Instruments with Patent Pivot Joint see page 82

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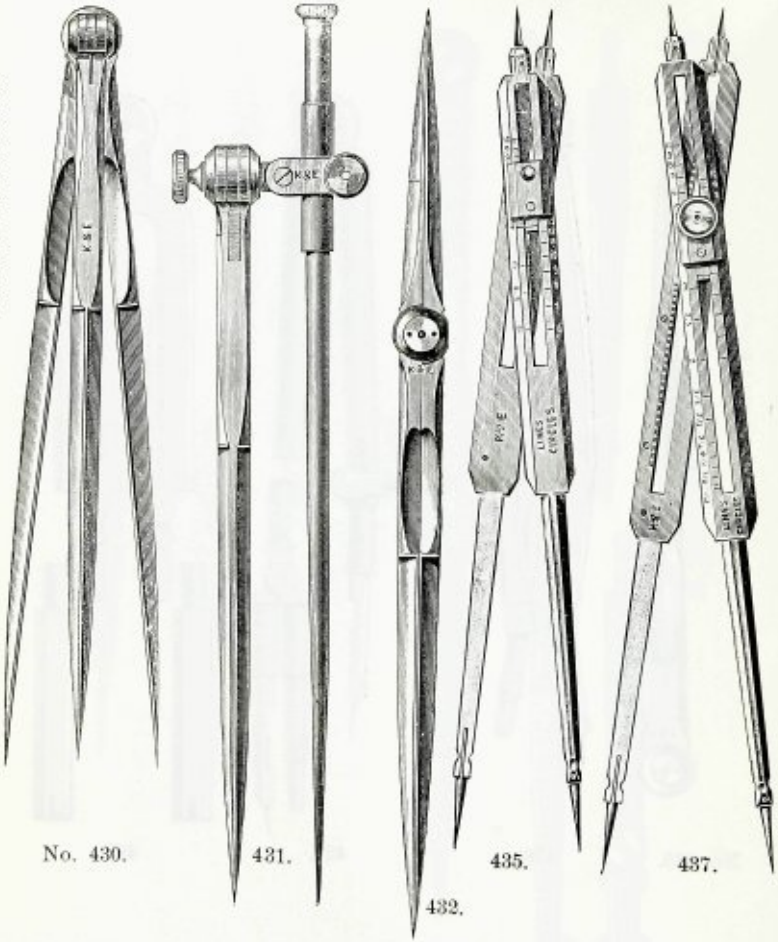


No. 425. 426. 427. 428.

425.	Pocket Dividers with Sheath, 5 in.	each	$ 3 00
426.	Pocket Compasses with Folding Points, 5 in.	"	8 75
	Morocco Case, silk velvet lined	"	80
427.	Pillar Compasses, 5 in., 2 Needle Points, Pen and Pencil Point with Handle which can be withdrawn from the Compasses and used as small Bow-Pen and Bow-Pencil respectively	"	9 50
	Morocco Case, silk velvet lined	"	80
428.	Pillar Compasses, 5 in., similar to No. 427, with 2 Lengthening Bars	"	11 50
	Morocco Case, silk velvet lined	"	90

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No. 430. 431. 432. 435. 437.

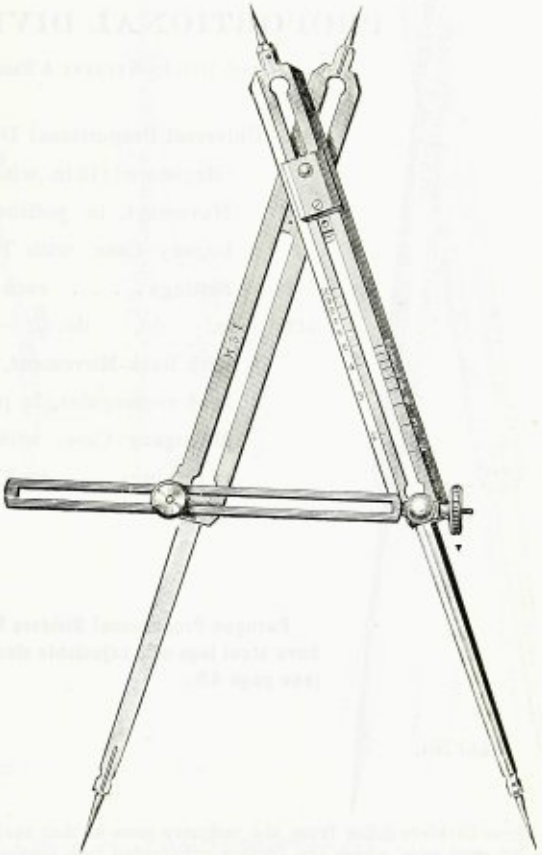
430.	Three-legged Dividers for taking off three points, 6 in. . .	each	$ 5 00
	Morocco Case, silk velvet lined	"	80
431.	Three-legged Dividers, one leg adjustable for length, 6 in.	"	5 75
	Morocco Case, silk velvet lined	"	90
432.	Whole-and-Half Dividers, 7½ in.	"	4 00
	Morocco Case, silk velvet lined	"	80
435.	Proportional Dividers, finely divided for lines and circles, 7½ in., ...	"	10 00
	Morocco Case, silk velvet lined	"	80
437.	Proportional Dividers, finely divided for lines and circles, 8½ in., with Rack-Movement	"	12 50
	Morocco Case, silk velvet lined	"	90

Paragon Proportional Dividers have steel legs with adjustable steel points. (see page 49)

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 439.



441.

439. Proportional Dividers, finely divided for lines and circles, 9 in., with Rack-Movement . . . . . each $ 15 00
Morocco Case, silk velvet lined . . . . . " 1 10

441. Proportional Dividers, finely divided for lines, circles, planes and solids, 9 in., with Micrometer Adjustment, each 16 50
Morocco Case, silk velvet lined . . . . . " 1 20

Paragon Proportional Dividers have steel legs with adjustable steel points. **(see page 49).**

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

"Copyright, 1894, by Keuffel & Esser Co."



UNIVERSAL PROPORTIONAL DIVIDERS.

Registered, 1893, by Keuffel & Esser Co.

440. Universal Proportional Dividers, (Registered) 10 in., with Rack-Movement, in polished Mahogany Case, with Table of Settings . . . . each $17 50

442 do. do. do. 10 in., with Rack-Movement, points bent rectangular, in polished Mahogany Case, with Table of Settings . . . each $17 50

Paragon Proportional Dividers No. 440 have steel legs with adjustable steel points **(see page 49).**



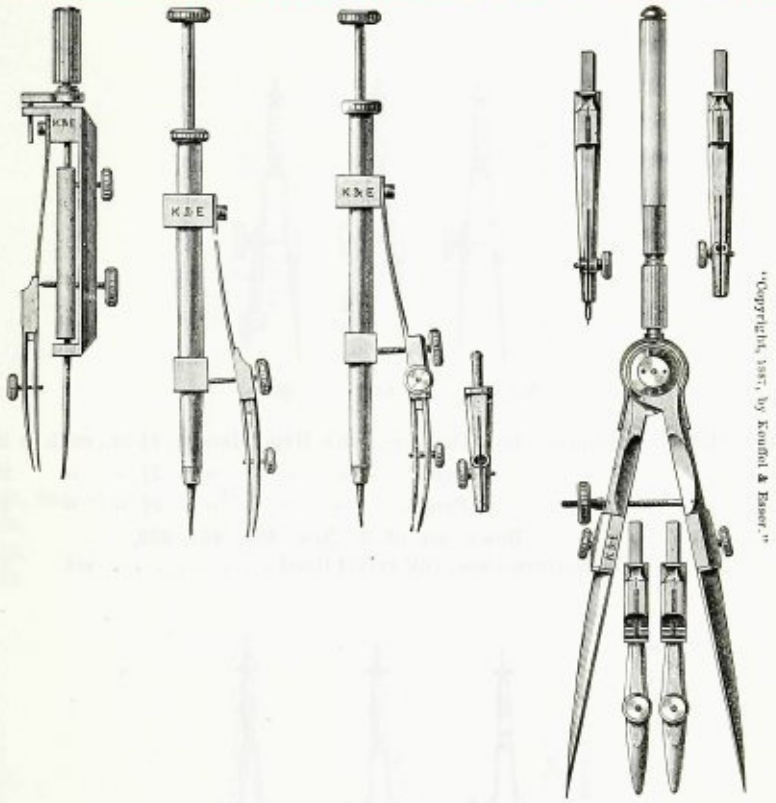
440 No.

No. 442.

These Dividers differ from the ordinary ones in that their whole length is divided into 200 **equal parts**, which are further subdivided into tenths by means of a vernier. These graduations are not carried over the entire length of the instrument, because those seen in the figure, from 10 to 110 reading with the vernier to 2000ths, are practically all that are necessary for the almost endless variety of purposes to which these Dividers may be applied. By this method of graduation **any desired ratio** may be set off. Thus setting 483 (taken from many others in a table of settings which accompanies each instrument) gives the ratio between the diameter and the circumference of a circle, that is, when the slide is set to this number by means of the vernier, the opening at one end will take in the diameter of a circle, and the opening between the points of the other end gives at once its circumference reduced to lineal measure. In like manner we have settings for such ratios as the diameter of a circle and the side of an equal square, feet and metres, yards and metres, etc. The list of settings for **Lines, Planes** and **Solids**, inclosed with each instrument, is much more complete than the series of fixed graduations on the best Dividers of the old style. The setting of the slide from such a table is effected more easily and more accurately than it can be done by the ordinary method. By means of the fully graduated scale very small departures from a given ratio can be both detected and ascertained.

Any other desired setting not found in the list, may be obtained by means of a very simple formula given with the table of settings.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



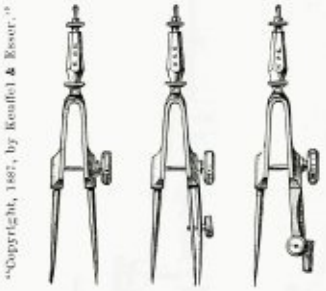
No. 452. 453. 454. 458.

452.	Drop Spring Bow Pen, 3½ in., with self-adjusting point, for very small circles	each	$ 3 75
	Morocco Case, silk velvet lined	"	60
453.	Drop Spring Bow Pen, 4 in., for very small circles	"	3 75
	Morocco Case, silk velvet lined	"	60
454.	Drop Spring Bow Pen and Pencil, 4 in. do. do.	"	5 00
	Morocco Case, silk velvet lined	"	60
458.	Spring Bow Compasses, 3½ in., with long Ivory Handle, 2 Steel Points, 2 Pen Points (for use as railroad pen), Pencil and Needle Point	"	8 25
	Morocco Case, silk velvet lined	"	1 00

Nos. 452, 453 and 454 are the most suitable instruments for drawing small circles. A rod passes through the instrument serving as handle and needle point. In Nos. 453 and 454 this center rod remains stationary while the instrument is turned and pen or pencil draw by their own weight, avoiding the slipping of the needle or scratching of the pen.

The pens of Nos. 452, 453, 454 have SPRING BLADE.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 460. 461. 462.

460. Minute Steelspring Bow Dividers, with Metal Handle, 2¼ in., each $ 2 00
461. " " " Pen, " " " 2¼ " " 2 50
462. " " " Pencil, " " " 2¼ " " 2 50
463. " " Bows, set of 3, Nos. 460, 461, 462, in morocco Case, silk velvet lined . . . . . set 7 80



No. 460½. 461½. 462½.

460½. Minute Steelspring Bow Dividers, with 2 Needle Points, Metal Handle, 2¼ in. . . . . each $ 2 85
461½. " " " Pen, with Needle Point, Metal Handle, 2¼ in. . . . . " 2 85
462½. " " " Pencil, with Needle Point, Metal Handle, 2¼ in. . . . . " 2 85
463½. " " Bows, set of 3, Nos. 460½, 461½, 462½, in morocco Case, silk velvet lined . . . . . set 9 35

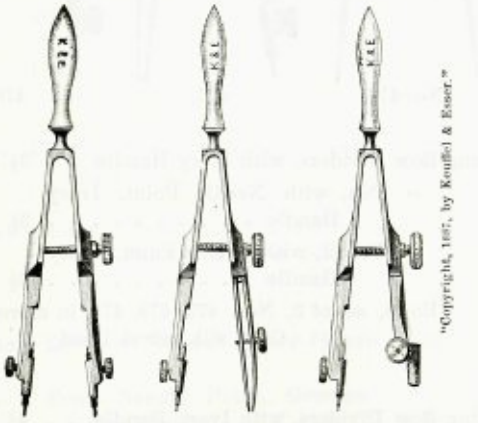
The pens of Nos. 461, 461½ have SPRING BLADE.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 464. 465. 466.

464.	Steelspring Bow Dividers, with Ivory Handle, 3 in.	each	$ 2 00
465.	" " Pen, " " " 3 "	"	2 50
466.	" " Pencil, " " " 3 "	"	2 50
467.	" Bows, set of 3, Nos. 464, 465, 466, in morocco Case, silk velvet lined	set	7 90



No. 468. 469. 470.

468.	Steelspring Bow Dividers, 2 Needle Points, Ivory Handle, 3 in.,	each	$ 2 85
469.	" " Pen, with Needle Point, " " 3 " "		2 85
470.	" " Pencil, " " " " " 3 " "		2 85
471.	" Bows, set of 3, Nos. 464, 469, 470, in morocco Case, silk velvet lined	set	8 60
471½.	" " set of 3, Nos. 468, 469, 470, in morocco Case, silk velvet lined	set	9 45

The Pens of Nos. 465, 469 have SPRING BLADE.

For Paragon Bows with Metal Handle, see pages 65, 66.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

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No. 476. 477. 478.

472.	Steelspring Bow Dividers, with Ivory Handle . .	$3\frac{1}{2}$ in.,	each	$	2 20
473.	" " Pen, with Needle Point, Ivory Handle	$3\frac{1}{2}$ "	"		3 00
474.	" " Pencil, with Needle Point, Ivory Handle	$3\frac{1}{2}$ "	"		3 00
475.	" Bows, set of 3, Nos. 472, 473, 474, in morocco Case, silk velvet lined		set		9 20
476.	Steelspring Bow Dividers, with Ivory Handle . .	$4\frac{3}{4}$ in.,	each	$	2 40
477.	" " Pen, with Needle Point, Ivory Handle	$4\frac{3}{4}$ "	"		3 25
478.	" " Pencil, with Needle Point, Ivory Handle	$4\frac{3}{4}$ "	"		3 25
479.	" Bows, set of 3, Nos. 476, 477, 478, in morocco Case, silk velvet lined		set		10 15

The pens of Nos. 473, 477 have SPRING BLADE.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 480. 481. 482.

480.	Steelspring Bow Dividers, German Silver Handle, 3½ in.,	each		$ 2 00
481.	" " Pen, Needle Point, German Silver Handle . . . . . 3½ "	"		2 50
482.	" " Pencil, Needle Point, German Silver Handle . . . . . 3½ "	"		2 50
483.	" Bows, set of 3, Nos. 480, 481, 482, in morocco Case, silk velvet lined	set		8 00
480½.	Steelspring Bow Dividers, German Silver Handle, 3 in.,	each		1 75
481½.	" " Pen, Needle Point, German Silver Handle . . . . . 3 in.,	"		2 50
482½.	" " Pencil, Needle Point, German Silver Handle . . . . . 3 in.,	"		2 50
483½.	" Bows, set of 3, Nos. 480½, 481½, 482½, in morocco Case, silk velvet lined . .	set		7 75

The pens of Nos. 481, 481½ have SPRING BLADE.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

"Copyright, 1891, by Keuffel & Esser."



No. 485.



486.



487.

485. Steelspring Bow Dividers, German Silver Handle, 3½ in. each $ 2 60

486. " " Pen, with Needle Point, German Silver Handle . . . . 3½ " " 3 25

487. " " Pencil with Needle Point, German Silver Handle . . . . 3½ " " 3 25

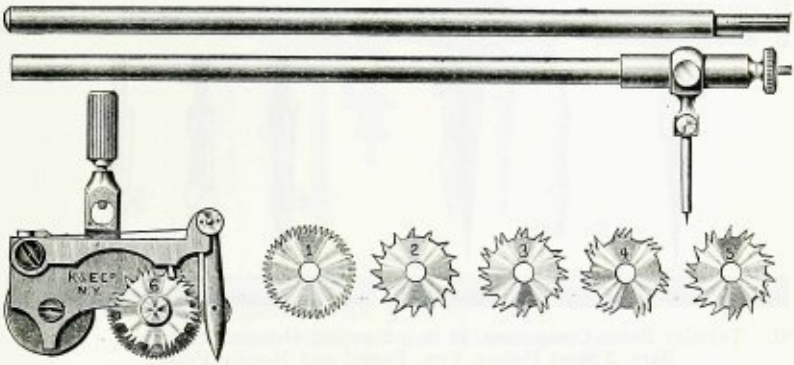
488. " Bows, set of 3, Nos. 485, 486, 487, in morocco Case, silk velvet lined . . . . set 10 35

Steelspring Bows Nos. 485, 486, 487 are opened and closed by a right and left thread, which is operated by one thumbnut situated between the shanks of the instrument; this thread also holds the points rigidly and doubles the speed of the screw.

The Pen of No. 486 has SPRING BLADE.

UNIVERSAL DOTTING INSTRUMENT.

For Straight Lines and Circles.



490. Universal Dotting instrument, German Silver, 12 in. bar in two sections, six wheels, Micrometer Adjustment, in velvet lined morocco Case, ... each, $ 8 50

This instrument for drawing dotted straight lines and circles is of practical construction and does good work. The wheels travel on the drawing and are therefore not liable to slip like those which travel on a straightedge.

The pen is attached to a carriage or head provided with a metal handle and a propelling and a supporting wheel. For dotting straight lines the instrument is held by its carriage, and may be so used along a straightedge. For dotting circles the carriage is clamped on the bar, which has a needle point with Micrometer Adjustment.

There are six ratchet wheels which are readily interchangeable by loosening the thumb screw. They produce the following patterns :

1 ----------

2 — — — — — — — —

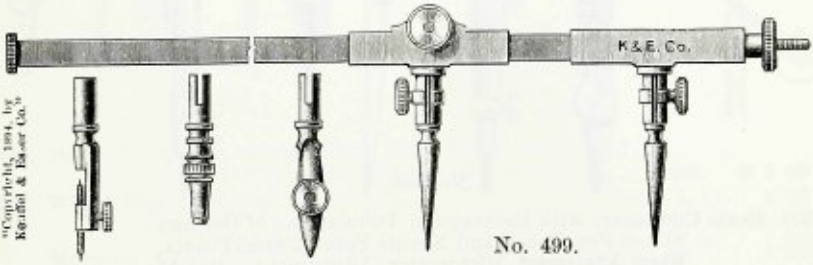
3 — · — · — · — · — ·

4 — · — · — · — · — ·

5 — · — · — · — · — ·

6 — — — — · — · — · —

PARAGON BEAM COMPASSES.



"Copyright, 1894, by Keuffel & Esser Co."

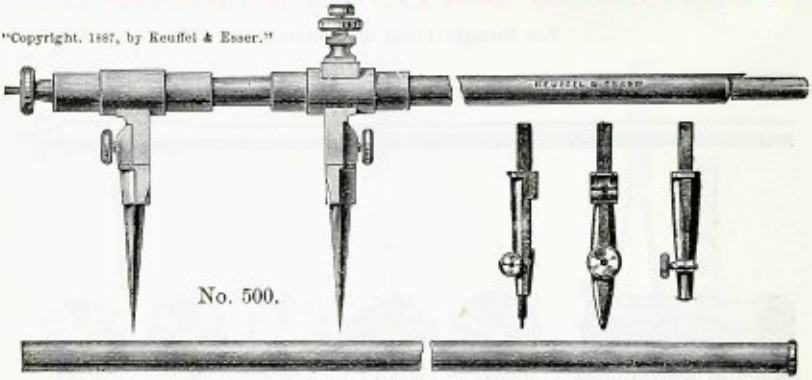
No. 499.

499. Tubular Beam Compasses, 12 in., square German Silver Bar, with 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment . . . . . each $ 7 50

Morocco Case, silk velvet lined 1 50

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

"Copyright, 1887, by Keuffel & Esser."



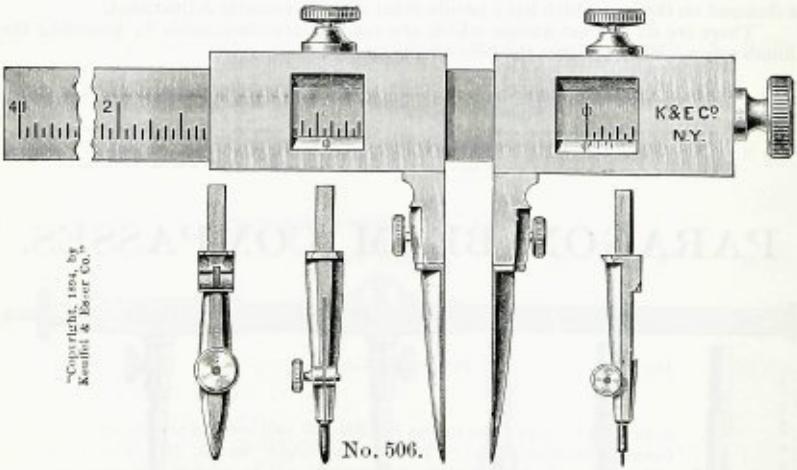
No. 500.

500. Tubular Beam Compasses, 18 in., 2 round German Silver Bars, 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment . . . . . each $ 10 50
501. do. do. do. do. 24 in., 3 Bars " 11 75
502. do. do. do. do. 36 " 3 " " 15 25

The bar of No. 502 is heavier than those of the smaller sizes.

503. Wheel Attachment for No. 500 or 501 . . . . . each 2 50
504. " " " " 502 . . . . . " 2 75

Morocco Case, silk velvet lined, for No. 500 501 502
each $ 1 50 1 75 2 25
do. do. do. if with No 503 or No. 504 add 25

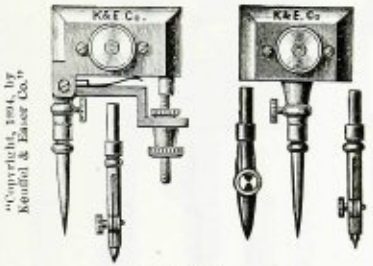


"Copyright, 1894, by Keuffel & Esser Co."

No. 506.

506. Beam Compasses with Rectangular Tubular Bar of German Silver, Pen, Pencil and Needle Point, 2 Steel Points, **Wheel Attachment**, Micrometer Adjustment. Bar 44 in. long, divided to $\frac{1}{20}$ inch and by vernier to $\frac{1}{200}$ inch; and 1 meter to millimeters and by vernier to $\frac{1}{10}$ millimeter. Instrument in polished Mahogany Case . . . . . each $ 35 00

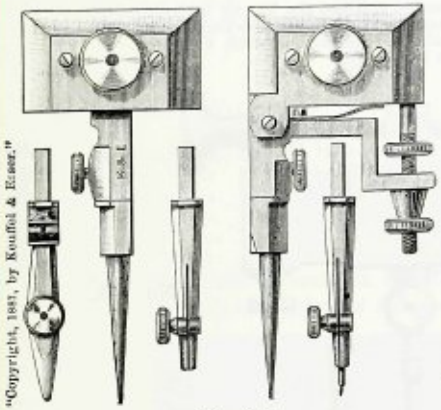
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



"Copyright, 1914, by Keuffel & Esser Co."

No. 509.

509.	Minute Beam Compasses with 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment	each	$ 7 50
509½.	Wheel Attachment for No. 509	"	2 25
	Morocco Case, silk velvet lined, for No. 509	"	1 25
	" " " " " " " 509 and No. 509½	"	1 50



"Copyright, 1887, by Keuffel & Esser."

No. 510.

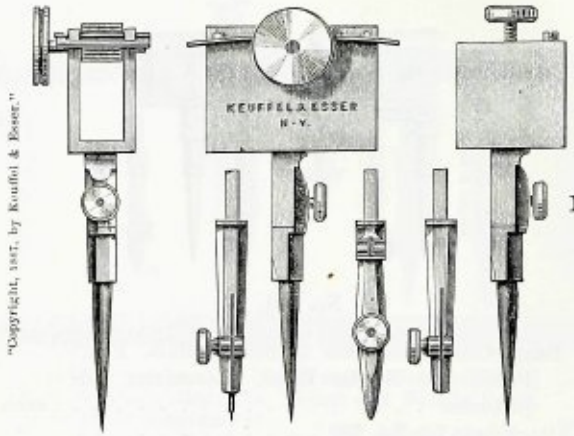


511.

510.	Beam Compasses with 2 Steel Points, Pen, Pencil and Needle Point, Micrometer Adjustment . . .	each	$ 9 00
511.	Wheel Attachment for No. 510	"	2 25
	Morocco Case, silk velvet lined, for No. 510	"	1 25
	" " " " " " " 510 and No. 511	"	1 75

For Wooden Bars for Beam Compasses see page 229.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

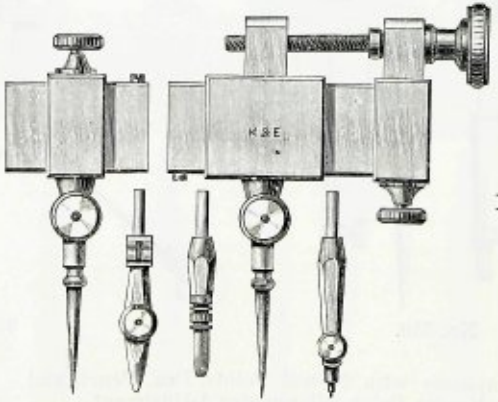


"Copyright, 1887, by Keuffel & Esser."

No. 512.

512.	Beam Compasses with 2 Steel Points, Pen, Pencil and Needle Point	each	$ 9 75
513.	Wheel Attachment for No. 512	"	2 75
	Morocco Case, silk velvet lined, for No. 512	"	1 25
	" " " " " " " 512 and No. 513	"	1 75

No. 512 has a pinion which is pressed against the bar by a spring and turned by a thumbscrew, as illustrated by above end-view. The pinion serves for fine adjusting without interfering with the free sliding of the compass-head along the bar.



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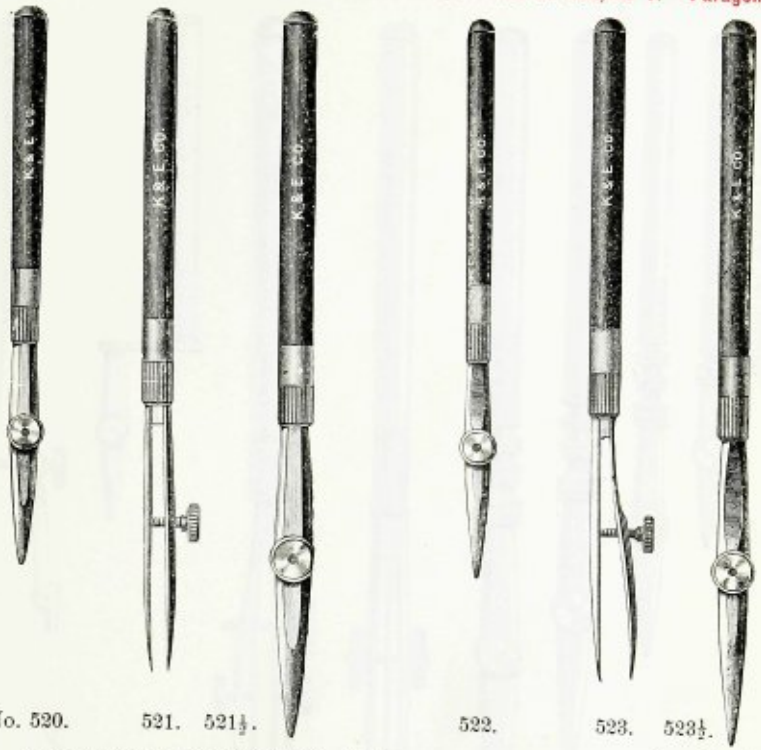
No. 515.

515.	Beam Compasses, McCord's pattern, Micrometer Adjustment, 2 Steel Points, Pen, Pencil and Needle Point	each	$ 14 00
516.	Wheel Attachment for No. 515	"	3 00
	Morocco Case, silk velvet lined, for No. 515	"	1 25
	" " " " " " " 515 and No. 516	"	1 75

For Wooden Bars for Beam Compasses see page 229.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. **Paragon.**

"Copyright, 1894, by Keuffel & Esser Co."



No. 520. 521. 521½. 522. 523. 523½.

520.	Drawing Pen, Ebony Handle, 4½ in. . . . . each	$	1 00
521.	" " " " 5 " . . . . . "		1 10
521½.	" " " " 5½ " . . . . . "		1 25
522.	" " " " upper blade with spring, 4½ in. "		1 10
523.	" " " " " " " " 5 " "		1 20
523½.	" " " " " " " " 5½ " "		1 35
	Above pens with Aluminum Handle . . . . . extra "		10

For Patent and Improved Paragon Pens, see pages 73, 107.

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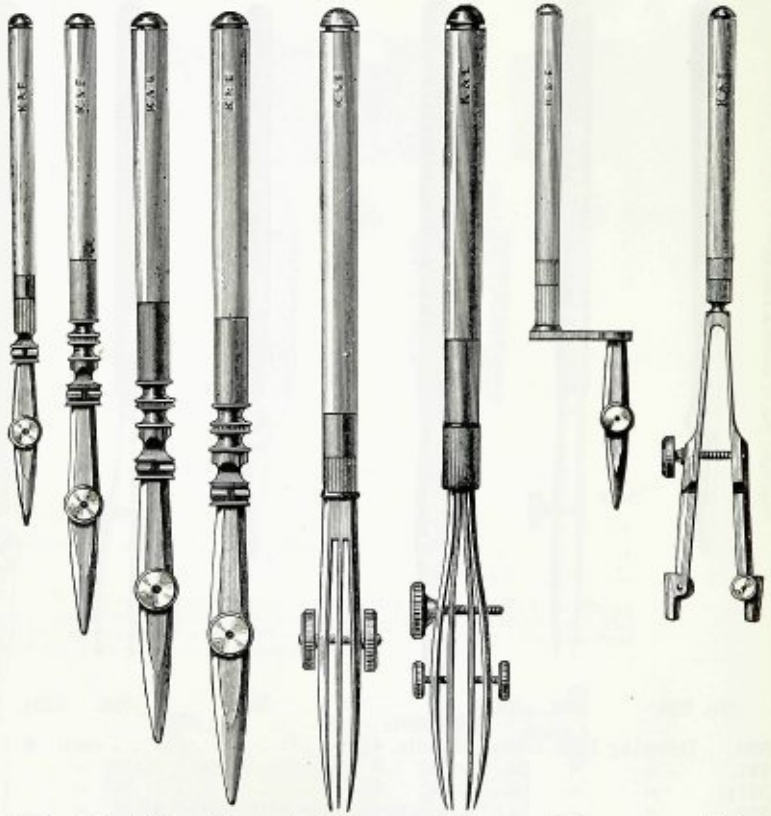
No. 525.

525. Paragon Drawing Pen, Aluminum Handle, with 3 interchangeable pens of different size, upper blades of pens with spring in morocco Case, silk velvet lined . . . . . set $ 3 75

Drawing Pens carefully set and sharpened . . . . each $ 15 to 20.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

"Copyright, 1887, by Keuffel & Esser."



No. 526. 527. 528. 529. 535. 536. 540. 543.

526.	Drawing Pen with Joint, Ivory Handle, 4 in.	each	$ 1 40
527.	" " " " and Pin, Ivory Handle, 4¾ in. . .	"	1 60
528.	" " " " " " " " 5½ " . .	"	1 80
529.	" " " " " " " " 6½ " . .	"	2 00
530.	" " " " " " " " German Silver blades, for red ink, 5½ " . .	"	1 80
535.	Border Pen, for broad lines, Ivory Handle . . . 6½ " . .	"	3 00
536.	" " " " " " " improved 6½ " . .	"	3 50

Border Pen No. 536 may be used also as Railroad Pen by filling only the two pairs of blades with ink.

540.	Curve Pen, Ivory Handle, 4½ in.	"	1 25
543.	Railroad Pencil, Ivory Handle, 5 in.	"	3 25
	Above instruments with Aluminum Handle . . . . extra	"	10

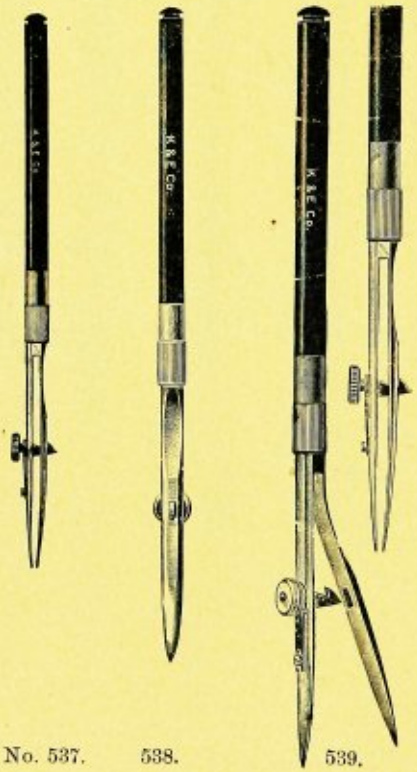
For Patent Paragon Pens, see next page.

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

THE CLICK PEN

A NEW PARAGON PEN

Patented



No. 537. 538. 539.

537.	Click Paragon Pen,	Ebony	Handle,	4½	in.	each	$1 50
538.	do.	do.	do.	"	5 in.	"	1 60
539.	do.	do.	do.	"	5½ in.	"	1 75

The Click Pens have the advantage over others that they can be opened (for cleaning) and closed in much less time, that the adjustment for width of line is not disturbed by opening and closing the pen and that the thread of the screw is not so easily worn off.

When using the Click Pen the draftsman can interrupt his drawing, for cleaning the pen without having to re-adjust it for width of line.

The upper blade of the Click Pen is made to spring open when released. It is held by a steel hook which passes through a slot, and is kept in place by a spring. From this hook a thread extends, passing through the other blade; a thumb nut regulates the setting of the blades for width of line. The pen is opened by pushing the hook off its bearings, and it is closed by pressing the blade down, when the hook catches automatically.

PATENT PARAGON DRAWING PENS.

Pat. Oct. 15, 1901.



No. 532.



No. 533.



No. 534.

532.	Patent Paragon Drawing Pen, Ebony Handle, 4½ in . . . each	$ 2 00
533.	" " " " " " 5 " . . . "	2 20
534.	" " " " " " 5½ " . . . "	2 40
	Above pens with Aluminum Handle, extra, ... "	10

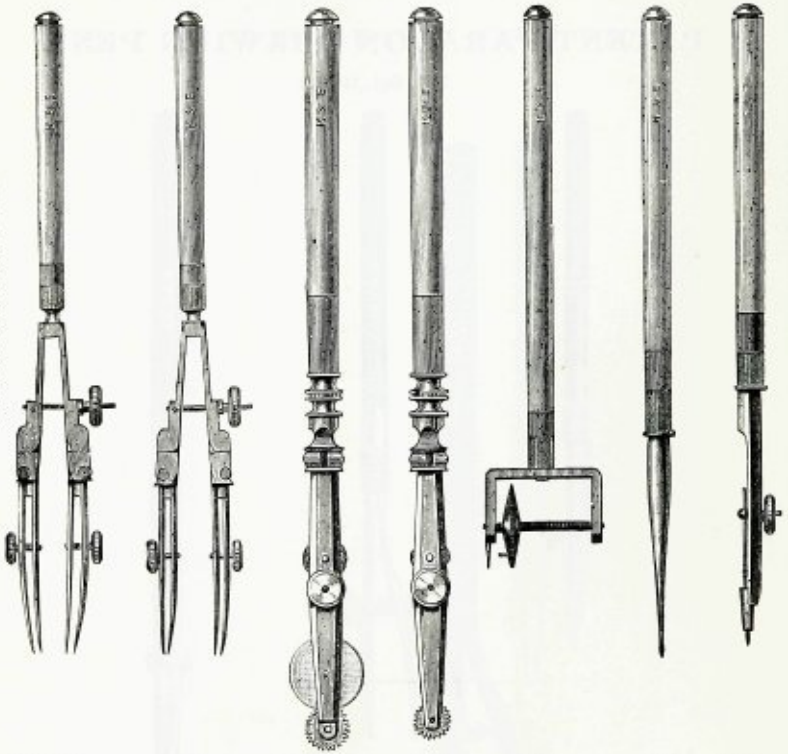
The Patent Paragon Drawing Pens possess all the excellent qualities which have made our Paragon Pens famous. In addition they can after opening for cleaning, be closed without altering the setting for width of line. This feature is much appreciated by the draftsman, as it enables him to clean the pen while he is engaged on a drawing with the certainty of restoring the setting of the pen after the cleaning, thus securing uniform width of lines.

The upper blade of these pens springs open when it is released and the setting for width of line is regulated by the thumbscrew attached to a steel lug which passes through the spring blade and engages an eccentric which holds or releases the spring blade.

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

"Copyright, 1881, by Keuffel & Esser."



No. 544. 545. 550. 551. 555. 556. 557.

544. Railroad Pen with Joints to blades and in shanks, Ivory Handle, 5½ in. . . . . each $ 3 50

545. Railroad Pen with Joints to blades and in shanks, K & E improved, Ivory Handle, 5½ in . . . . . " 3 75

The improvement consists in having both pens bent in the same direction, so that lines can be drawn against a straightedge or rule as readily as with a ruling pen.

550. Dotting Pen with 6 Wheels, Ivory Handle, 6 in. . . . . each $ 3 75

551. do. do. 6 " " " improved, 6 in. " 4 25

The improved Dotting Pen No. 551, is doubtless the best pen for the purpose, as it entirely prevents blotting, provided the ink be not too thin. The reservoir, after being filled, is closed and supplies no more ink to the dotting wheel than is actually required.

555. Opisometer, Ivory Handle, for measuring curved lines 4½ in. each $ 1 80

556. Tracer, Ivory Handle 5 in. . . . . " 90

557. Pricker, Ivory Handle 5 in. . . . . " 1 75

Above instruments with Aluminum Handle, . . . extra " 10

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



695 696

see foot-note *

No. 558–1. 558–2. 558–3.

558–1.	Detail Drawing Pen, 5 in., upper blade with spring, flat Ebony Handle					each	$ 1 60
558–2.	do.	do.	do.	6 in.		"	1 70
558–3.	do.	do.	do.	7 "		"	1 80
	Above pens with Aluminum Handle, extra					"	10



559. Fine German Silver Lead Box, screw cap, containing 6 leads . . . . . each $ 25

***For other Paragon Pens, see page 107.**

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

PARAGON INSTRUMENTS

IN MOROCCO POCKET CASES, SILK VELVET LINED.
THE VERY BEST INSTRUMENTS MADE.

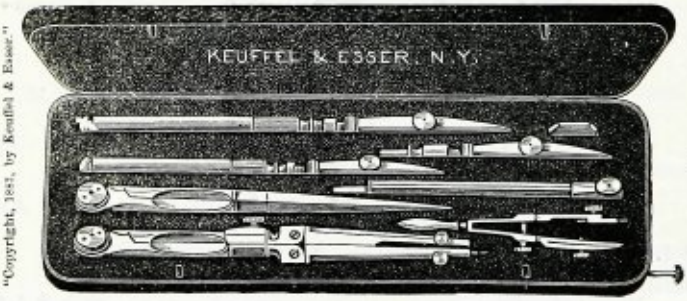
(For Description see page 42.)

SHOULD OTHER ASSORTMENTS THAN HERE LISTED, BE REQUIRED WE CAN FURNISH THEM IN ANY COMBINATION TO SUIT THE PURCHASER.



No. 560.

560. Bar-lock Pocket Case,
cont'g: 1 Plain Divider, 3½ in., with Handle, No. 401,
1 Compass, 3½ in., with Handle, with fixed Needle Point, Pen and Pencil Point, No. 404,
1 Drawing Pen, 4 in., with Joint, Ivory Handle, No. 526
1 German Silver Box with Leads, No. 559 . . . . . each $ 10,00



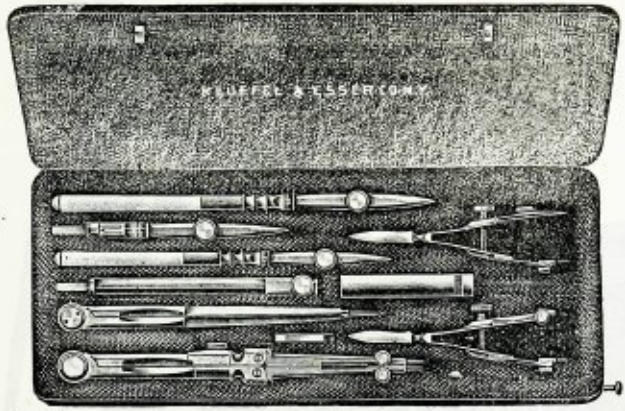
No. 565.

565. Bar-lock Pocket Case,
cont'g: 1 Plain Divider, 5 in., No. 410,
1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 415,
1 Steelspring Bow Pen No. 469,
1 Drawing Pen, 4¾ in., with Joint and Pin, Ivory Handle, No. 527,
1 Drawing Pen, 5½ in., with Joint and Pin, Ivory Handle, No. 528,
1 German Silver Box with Leads, No. 559 . . . . each $ 17 50

565P. Pocket Case with **folding flaps**, containing same assortment as No. 565 . . . . . each $ 17 80

For empty cases for instruments see page 140.

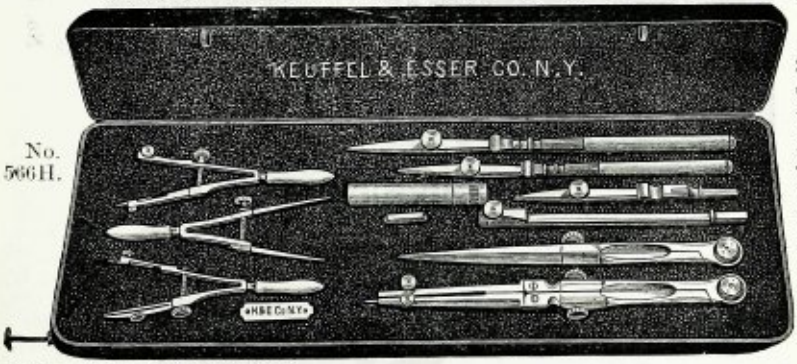
Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 565½.

565½. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 415,
1 Plain Divider, 5 in., No. 410,
1 each Steelspring Bow Pen and Pencil, No. 469, 470,
1 each Drawing Pen, with Joint and Pin, Ivory Handle, No. 527, 528,
1 German Silver Box with Leads, No. 559 . . . . each $ 20 35

565½ P. Pocket Case with **folding flaps,**
cont'g: same assortment as No. 565½ 20 65



No. 566 H.

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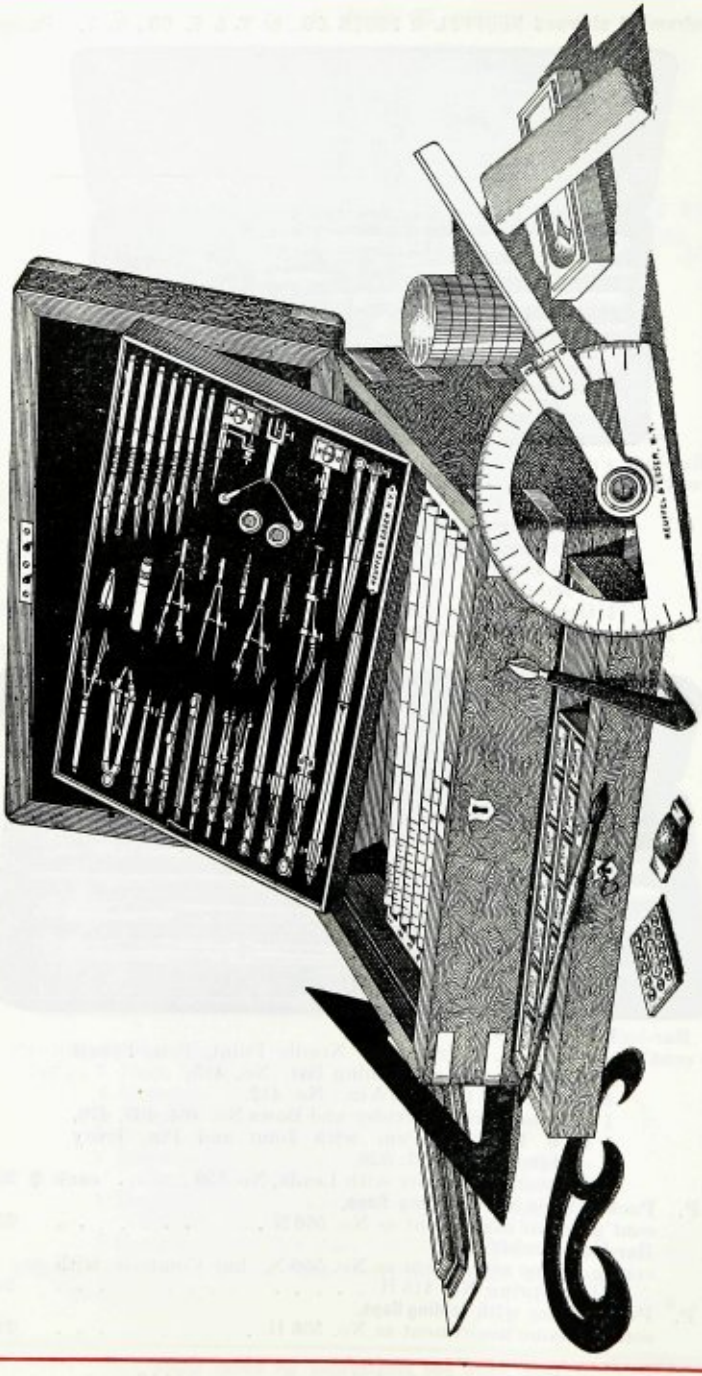
566 N. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 415,
1 Hairspring Divider, 5 in., No. 412,
1 Set Steelspring Divider and Bows No. 464, 469, 470,
1 each Drawing Pen, with Joint and Pin, Ivory Handle, No. 527, 528,
1 German Silver Box with Leads, No. 559 . . . . each $ 23 15

566 N. P. Pocket Case with **folding flaps,**
cont'g: same assortment as No. 566 N 23 45

566 H. Bar-lock Pocket Case,
cont'g: same assortment as No. 566 N, but Compass with Hair Spring No. 415 H. 24 15

566 H. P. Pocket Case with **folding flaps,**
cont'g: same assortment as No. 566 H. 24 45

For empty cases for instruments see page 140.



No. 588.

"Copyright, 1887, by Keuffel & Esser."

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

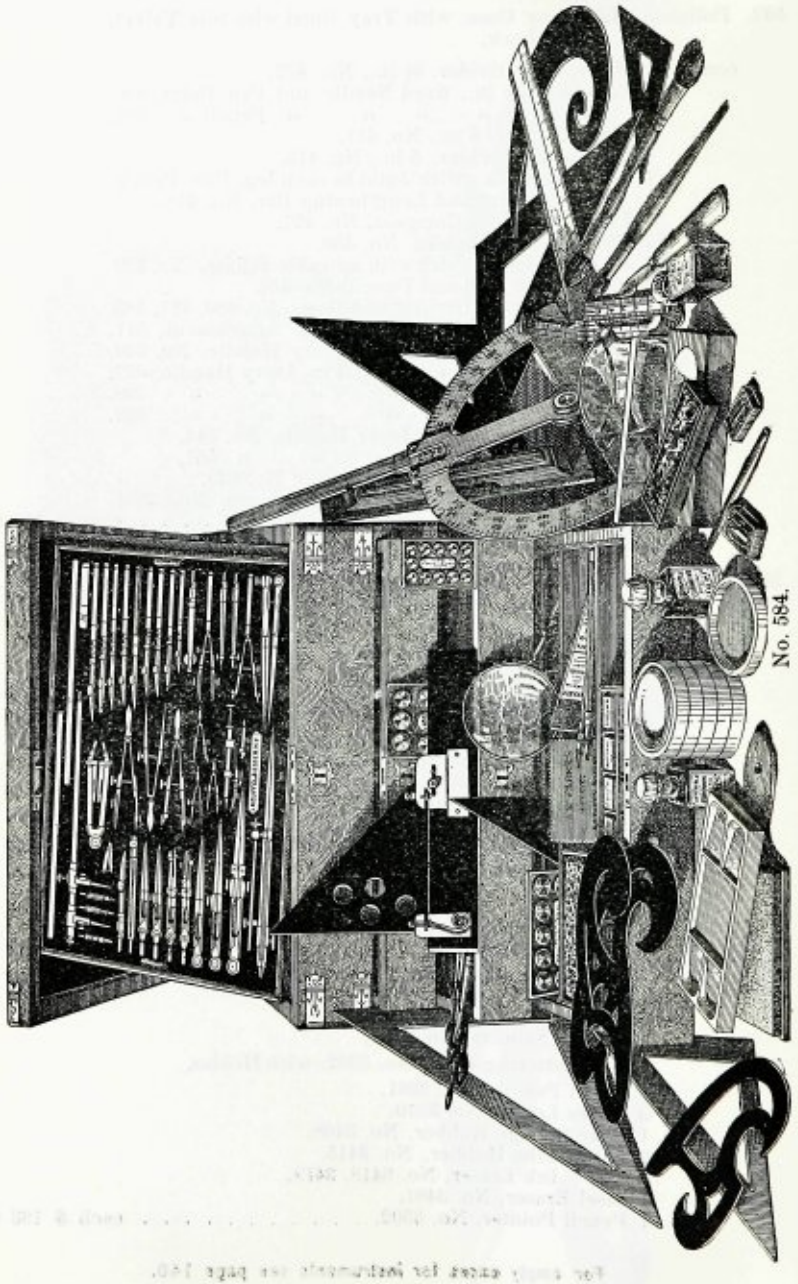
582. Polished Mahogany Case, with Tray lined with Silk Velvet, with Lock,

cont'g: 1 Hairspring Divider, 3½ in., No. 402,
1 Compass, 3½ in., fixed Needle and Pen Point, 406,
1 do. 3½ " " " " Pencil " 407,
1 Plain Divider, 6 in., No. 411,
1 Hairspring Divider, 6 in., No. 413,
1 Compass, 6½ in., with Joint in each leg, Pen, Pencil Needle Point and Lengthening Bar, No. 418,
1 Pocket or Pillar Compass, No. 427,
1 Three-legged Divider, No. 430,
1 Proportional Divider with movable Points, No. 439
1 Spring Bow Pen and Pencil, No. 454,
1 Set Steelspring Divider and Bows, No. 480, 481, 482,
1 Beam Compass 510, with Wheel Attachment, 511,
1 Drawing Pen, 4 in., Joint, Ivory Handle, No. 526,
2 do. 4¾ " " Pin, Ivory Handle, 527,
2 do. 5½ " " " " " 528,
1 do. 6½ " " " " " 529,
1 Railroad Pen, 5½ in., Ivory Handle, No. 544,
1 Dotting Pen, 6 " " " " 551,
1 Adjusting Key and Screw Driver No. 825,
2 Horn Centres with German Silver rim, No. 2691,
1 German Silver Box with Leads, No. 559 . . . . each $ 112 00

583. Fine polished Mahogany Case, **with Tray** lined with Silk Velvet, **Drawer**, German Silk Bands and Corners, with Lock,

cont'g: same instruments as No. 582, and in addition:
1 Set (8) Paragon Scales like No. 1576 P,
1 Paper Cutter, No. 2701,
1 Protractor, No. 1226,
1 German Silver Parallel Rule, No. 1750,
2 doz. each German Silver Thumb Tacks, 2622, 2625,
1 Tacklifter, No. 2680,
1 each Xylonite Triangle, No. 1855, 5, 8, 12 in.,
1 " " " " 1856, 4, 7, 10 "
1 " " Curve, " 1860, —4,—13, —19
1 Set of 18 Full Pans, Technical Water Colors, No. 2900 and 2901,
1 Cake Chinese Ink, No. 3031, VIII,
1 doz. assorted Camel Hair Brushes, No. 3102,
1 each black Sable Brush, No. 3120, 1, 2, 6, 10, 14, 18,
1 " double Camel Hair Brush, No. 3135, 1, 3,
1 Camel Hair Brush, No. 3136, 3,
1 Patent Ink Slab, No. 3151,
1 Nest of Saucers, No. 3161,
1 doz. Lettering Pens, No. 3202, with Holder,
3 Artist Pencils, No. 3361,
3 Boxes Leads, No. 3370,
1 Cake Sponge Rubber, No. 3408,
2 Cakes Alba Rubber, No. 3415,
2 " Ink Eraser, No. 3418, 3419,
1 Steel Eraser, No. 3481,
1 Pencil Pointer, No. 3502, ... each $ 193 00

For empty cases for instruments see page 140.



No. 584.

"Copyright, 1881, by Keuffel & Esser."

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

584. Magazine Case, Polished Hardwood, with Tray lined with Silk Velvet three Drawers, ornamental Metal Corners, Bands, Hinges, Escutcheons and Name-Plate.

cont'g:

1 Hairspring Divider 3½ in., No. 402,
1 Plain Divider, 3½ in., No. 401,
1 Compass, 3½ in., with fixed Needle and Pen Point, No. 406,
1 do. 3½ " " " " " Pencil " " 407,
1 Plain Divider, 5 in., No. 410,
1 Hairspring Divider, 6 in., No. 413,
1 Compass, 7 in., with Joint in each leg, Pen, Pencil, Needle Point, Lengthening Bar and Dotting Pen, No. 419,
1 Pocket Compass, No. 427,
1 Three-legged Divider, No. 430,
1 Proportional Divider with Micrometer Adjustment, No. 441,
1 Drop Spring Bow Pen and Pencil, No. 454,
1 Set Steelspring Divider and Bows, No. 460, 461, 462,
1 " " do. " do. No. 476, 477, 478,
1 Tubular Beam Compass, 36 in., No. 502,
1 Drawing Pen, 5 in., Ebony Handle, No. 521,
1 do. 4 " with Joint, Ivory Handle, No. 526,
2 do. 4¾ " " " and Pin, Ivory Handle No. 527,
2 do. 5½ " " " " " " " " 528,
1 do. 6½ " " " " " " " " 529,
1 Railroad Pencil, 5 in., Ivory Handle, No. 543,
1 " Pen, 5½ in., Ivory Handle, No. 544,
1 Improved Dotting Pen, 6 in., Ivory Handle, No. 551,
1 Pricker, Ivory Handle, No. 557,
1 Adjusting Key and Screwdriver, No. 825,
1 German Silver Box with Leads, No. 559,
1 Casey's Section Liner, No. 1157,
1 Protractor with Arm and Vernier, No. 1226,
1 Set (8) Paragon Scales like No. 1576 P, 1 Scale Rule, No. 1720,
1 German Silver Parallel Rule, No. 1751,
1 Set Xylonite Lettering Triangles, No. 1859,
1 each do. Triangle, No. 1855, 5, 8, 12 in.,
1 " do. do. " 1856, 4, 7, 10 "
1 " do. Curve, No. 1860, 4, 13, 19,
1 " do. Logarithmic Spiral Curve No. 1861,
1 each Steel Triangle, No. 2002, 10½ in., No. 2003, 8 in.,
2 doz. each G. S. Tacks, No. 2622, 2626, 1 doz. Steel Tacks, No. 2600,
1 Tacklifter, No. 2680, 2 Horn Centres with rim No. 2691,
1 Set of 18 Full Pans Technical Colors, No. 2900 and 2901,
1 Set (6) Drawing Ink, like No. 3011, 1 Cake India Ink, No. 3031 XII.
1 doz. Brushes, No. 3102, 1 each Brush, No. 3123, 1, 2,
1 each Brush, No. 3120, 1, 2, 4, 6, 8, 10, 14, 18, 22,
1 " do. " 3133, 0, 3, No. 3135, 1, 3,
1 Slate Ink Slab, No. 3153, 1 Nest of Saucers, No. 3161,
1 Centre Slab, No. 3183, 1 Water Glass, No. 3187,
1 doz. each Pens, No. 3200, 3202, 1 each Penholder, No. 3220, 3221,
6 Artist Pencils, No. 3361, 6 Boxes Leads, No. 3370,
1 Cake Sponge Rubber, No. 3408, 2 Cakes Alba Rubber, No. 3415,
1 each Ink Eraser, No. 3418, 3419,
1 Pencil Pointer, No. 3507, 1 Steel Eraser, No 3480,
1 Reading Glass, No. 6970, 3 in, ... each $288 00

For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

PARAGON INSTRUMENTS

WITH ESSER'S PATENT PIVOT JOINT.

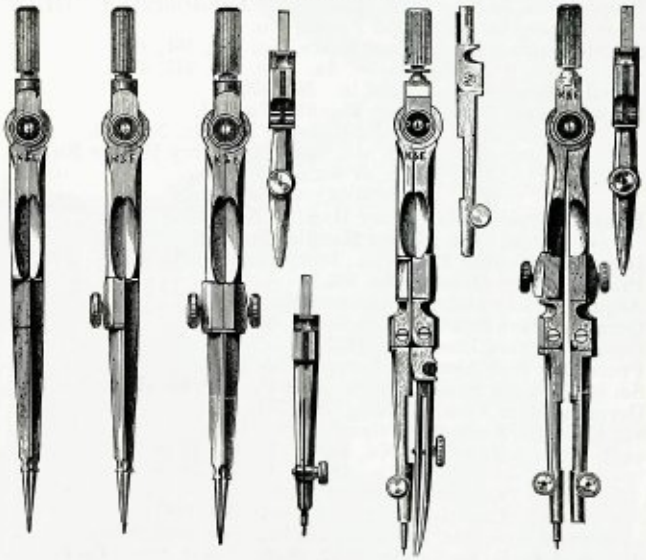
(Patented, March 14th and 28th, 1893.)

THE VERY BEST INSTRUMENTS MADE,

Of the same quality, workmanship and finish as the other Paragon Instruments Nos. 401 to 558-3

(For description see page 44.)

We list the Paragon Compasses with Esser's Patent Pivot joint also with the insertion pieces with round shaft aligned by a steel feather and held in a spring socket. This construction dispenses with the thumbscrew, as explained on page 47. (See cuts 603R, 610R)



"Copyright, 1894, by Keuffel & Esser Co."

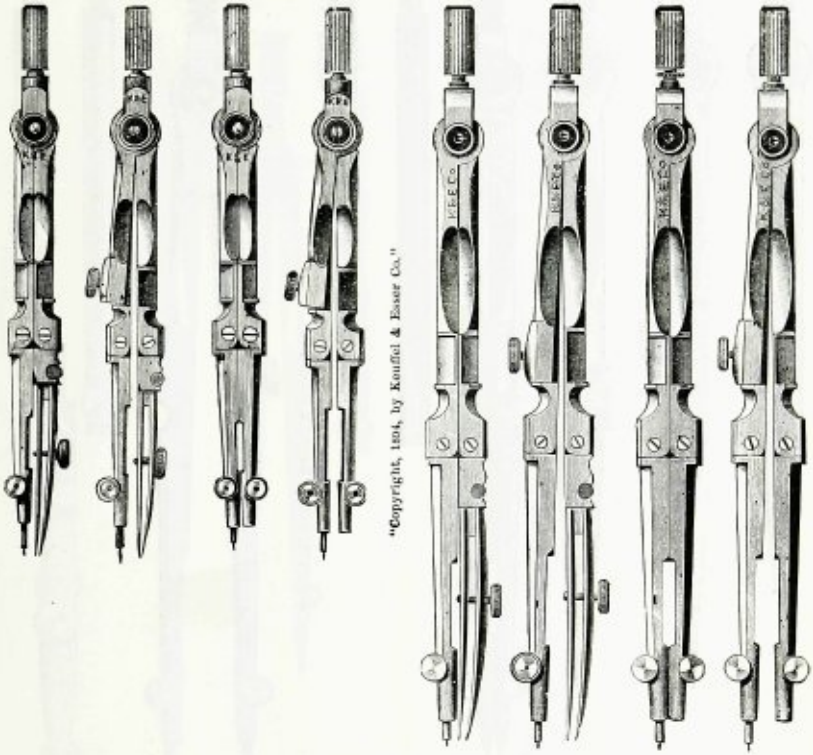
No. 600. 601. 602. 603R. 603 H.

600.	Plain Dividers, 3½ in.		each	$ 2 25
601.	Hairspring Dividers, 3½ in.		"	3 00
602.	Compasses, 3½ in., with 2 Steel Points, Pen, Pencil and Needle Point		"	7 00
603.	do. 3½ " "	fixed Needle Point, Pen and Pencil Point	"	6 00
603R.	do. 3½ "	like No. 603, but the insertion pieces with round shaft (no thumbscrew)	"	6 00
603 L.	do. 3½ " "	" 603, but with Lengthening Bar	"	6 75
603. LR.	do. 3½ " "	" 603L, but the insertion pieces with round shaft (no thumbscrew)	"	6 75
603H.	do. 3½ " "	" 603, but with Hairspring. . . .	"	7 00

For Paragon Instruments as above, but with Tongue-joint see page 53.

For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

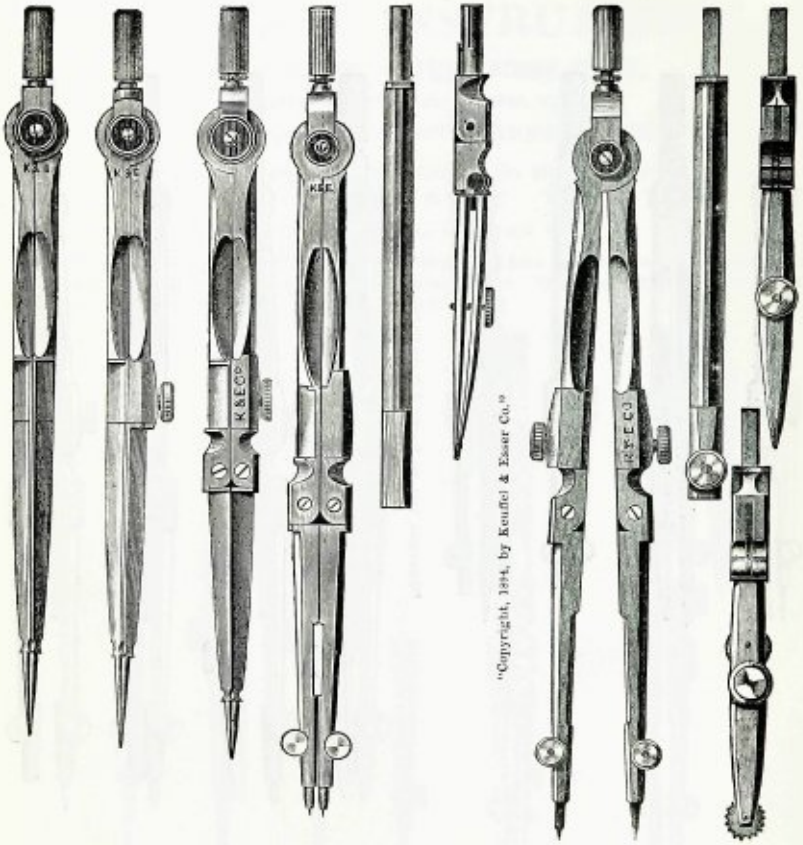


No. 604. 604 H. 605. 605 H. 604½. 604½ H. 605½. 605½ H

604.	Compasses,	3½	in.,	with fixed Needle and Pen Point . . . each	$ 4 00
604 H.	do.	3½	"	like No. 604, but with Hairspring . . "	5 00
605.	do.	3½	"	with fixed Needle and Pencil Point . . "	4 00
605 H.	do.	3½	"	like No. 605, but with Hairspring . . "	5 00
604½.	do.	5	"	with fixed Needle and Pen Point . . . "	4 75
604½ H.	do.	5	"	like No. 604½, but with Hairspring . . "	5 75
605½.	do.	5	"	with fixed Needle and Pencil Point . . "	4 75
605½ H	do.	5	"	like No. 605½, but with Hairspring . . "	5 75

For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

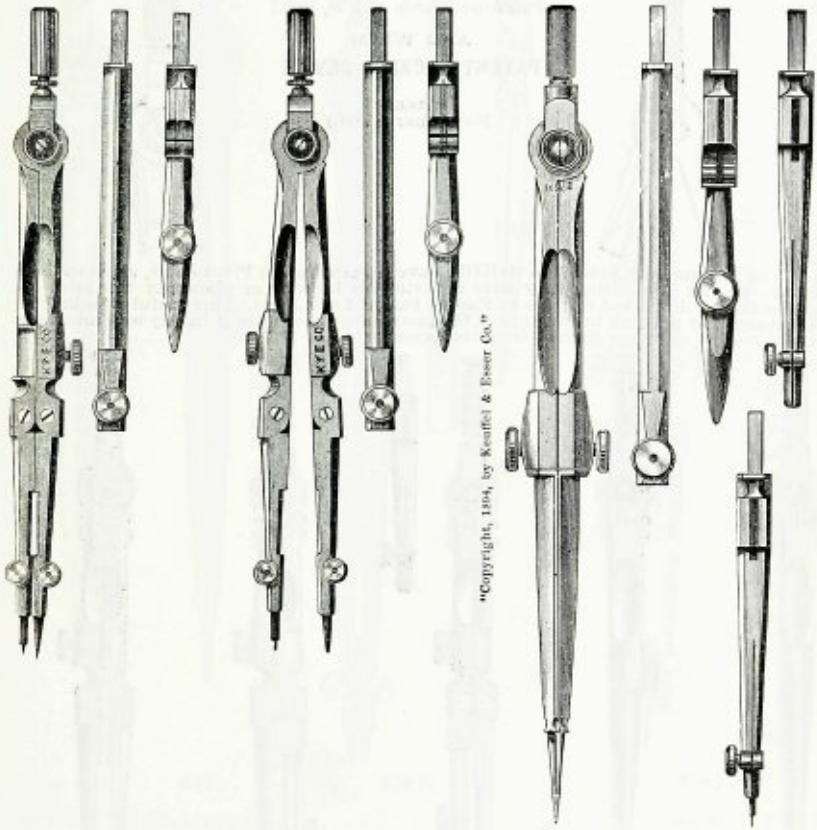


No. 606. 608. 608½. 610R. 610 HD.

606.	Plain Dividers, 5 in.	each	$ 2 50
607.	do. 6 "	"	3 00
608.	Hairspring Dividers, 5 in.	"	3 50
608½.	do. do 5 " with Joint in each leg	"	4 50
609.	do. do. 6 "	"	4 00
610.	Compasses, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar	"	7 50
610R.	do. 6 " like No. 610, but the insertion pieces with round shaft (no thumbscrew)	"	7 50
610 H.	do. 6 " like No. 610, but with Hairspring	"	8 50
610HR.	do. 6 " " " 610H, but the insertion pieces with round shaft (no thumbscrew)	"	8 50
610HD.	do. 6 " like No. 610H, but with improved Dotting Pen with 6 wheels	"	12 00
610HDR.	do. 6 " like No. 610HD., but the insertion pieces with round shaft (no thumbscrew)	"	12 00

For description of insertion pieces with round shaft see page 47.
For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



"Copyright, 1894, by Keuffel & Esser Co."

No. 611. 611 H. 612.

611.	Compasses,	4½	in.,	with fixed Needle Point, Pen, Pencil Point and Lengthening Bar . . .	each $ 7 25
611R.	do.	4½	"	like No. 611, but the insertion pieces with round shaft (no thumbscrew) . .	" 7 25
611 H.	do.	4½	"	like No. 611, but with Hairspring . .	" 8 25
611HR.	do.	4½	"	like No. 611 H, but the insertion pieces with round shaft (no thumbscrew) . .	" 8 25
612.	do.	6	"	with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar . . .	" 8 50
612R.	do.	6	"	like No. 612, but the insertion pieces with round shaft, (no thumbscrews) .	" 8 50

For description of insertion pieces with round shaft see page 47.
For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

PARAGON INSTRUMENTS



With ESSER'S PATENT PIVOT JOINT,

(Patented March 14 & 28, 1893.)

AND WITH

PATENT LOCKING DEVICE

(Patented November 6, 1894.)



The instruments Nos. 613 to 618HDR, have Esser's Patent Pivot Joint, as described on page 44, and in addition they have a device for locking or clamping the joint in any position as described on page 45: Esser's Patent Lock Joint. This useful attachment adds practically nothing to the bulk of the instrument, nor does it in any way interfere with any of its uses, nor detract from its appearance.



No. 613.



614.



615.



615-1

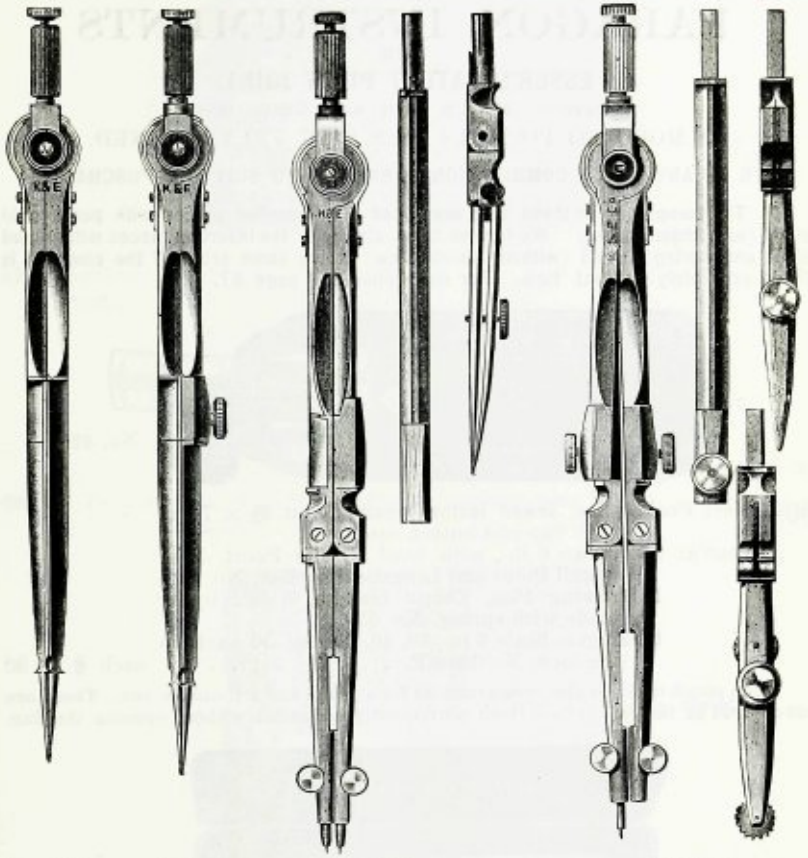


615-2

613.	Plain Dividers, 3½ in.		each	$ 2 85
614.	Hairspring Dividers, 3½ in.		"	3 60
615.	Compasses, 3½ in., with fixed Needle Point, Pen and Pencil Point		"	6 60
615H.	do.	like No. 615, but with **Hairspring**	"	7 60
615R.	do.	3½ in., like No. 615, but the insertion pieces with round shaft (no thumbscrew)	"	6 60
615-1	do.	3½ in., with fixed Needle Point with Hairspring and Pen Point	"	5 60
615-2	do.	3½ in., with fixed Needle Point with Hairspring and Pencil Point	"	5 60

For description of insertion pieces with round shaft see page 47.
For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



Nos. 616. 617. 618R. 618HD.

616.	Plain Dividers, 5 in.	each	$ 3	10
617.	Hairspring Dividers, 5 in.	"	4	10
618.	Compasses, 6 in., with fixed needle Point, Pen, Pencil Point and Lengthening Bar	"	8	10
618R.	do. 6 in., like No. 618, but the insertion pieces with round shaft (no thumbscrew) . .	"	8	10
618H.	do. 6 " like No. 618, but with Hairspring . .	"	9	10
618HR.	do. 6 " like No. 618 H, but the insertion pieces with round shaft (no thumbscrew) . .	"	9	10
618HD.	do. 6 " like No. 618 H, but with improved Dotting Pen Point	"	12	60
618HDR.	do. 6 " like No. 618HD, but the insertion pieces with round shaft (no thumbscrew) . .	"	12	60

For description of insertion pieces with round shaft see page 47.
For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

PARAGON INSTRUMENTS

WITH

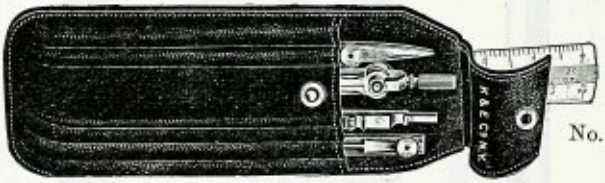
ESSER'S PATENT PIVOT JOINT.

(Patented, March 14th and 28th, 1893.)

IN MOROCCO POCKET CASES, SILK VELVET LINED.

SETS OF ANY OTHER COMBINATION FURNISHED TO SUIT THE PUSCHASER.

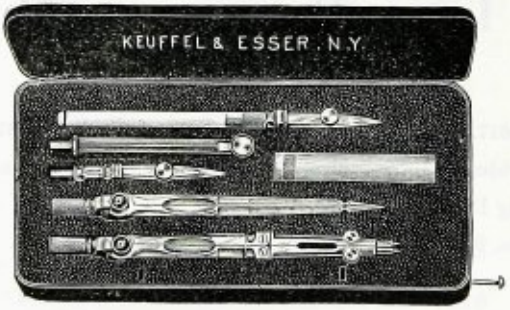
The Compasses in these sets are listed with insertion pieces with pentagonal shaft (with thumbscrew). We furnish them also with the insertion pieces with round shaft and spring socket (without thumbscrew) at the same price, if the compass is listed separately in that form. For description see page 47.



No. 619

619. Vest Pocket Set, **sewed leather pouch**, about 2½ × 7 in., with flap and button catch,
cont'g: 1 Compass 6 in , with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Drawing Pen, Ebony Handle, 5 in., upper blade with spring, No. 523,
1 Paragon Scale 6 in , 10, 40, 30 and 50 parts to the inch, No. 1419 P. . . . . each $ 12 00

The pouch contains also compartments for a pencil and a fountain pen. These are not covered by the flap, to have them conveniently accessible without opening the flap.



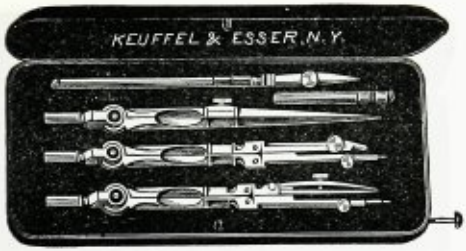
No. 620N.

620 N. Bar-lock Pocket Case,
cont'g: 1 Plain Divider, 3½ in., No. 600,
1 Compass, 3½ in., with Pen, Pencil, Needle Point and Lengthening Bar, No. 603 LR,
1 Drawing Pen, 4 in., with Joint, Ivory Handle, No. 526,
1 German Silver Box with Leads, No. 559 . . . . each $ 12 00

620 NP. Pocket Case **with folding flaps** containing same assortment as No. 620 . . . . . " 12 25

For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 621.

621. Bar-lock Pocket Case,
cont'g: 1 Hairspring Divider, 3½ in., No. 601,
1 Compass, 3½ in., with fixed Needle and Pen Point, No. 604,
1 Compass, 3½ in., with fixed Needle and Pencil Point, No. 605,
1 Drawing Pen, 4 in., with Joint Ivory Handle, No. 526,
1 German Silver Box with Leads, No. 559 . . . each $ 14 00

621 P. Pocket Case with **folding flaps** containing same assortment as No. 621 . . . . . " 14 25



No. 621 H.

621 H. Bar-lock Pocket Case,
cont'g: 1 Hairspring Divider, 3½ in., No. 601,
1 Compass, 3½ in., with fixed Needle Point with Hairspring and Pen Point, No. 604 H,
1 Compass, 3½ in., with fixed Needle Point with Hairspring and Pencil Point, No. 605 H,
1 Drawing Pen, 4 in., with Joint, Ivory Handle, No. 526,
1 German Silver Box with Leads, No. 559 . . . each $ 16 00

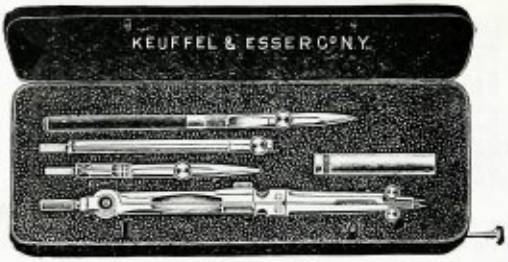
621 HP. Pocket Case with **folding flaps** containing same assortment as No. 621 H . . . . . " 16 25

621 HL. **Bar-lock case** containing same assortment as No. 621 H, but the Compasses and Divider with Esser's Patent Lock Joint . . . . . " 17 80

621 HLP. Pocket Case with **folding flaps** containing same assortment as No. 621 HL . . . . . " 18 05

For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



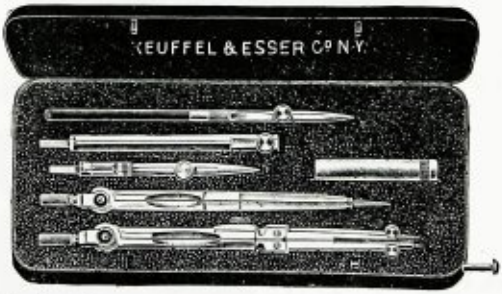
No. 622-1

622-1 Bar-lock Pocket Case,
cont'g: 1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar No. 610,
1 Drawing Pen, Ebony Handle, 5 in., upper blade with spring, No. 523,
1 German silver Box with Leads, No. 559 . . . each $ 10 70

622-1 P. Pocket Case with **folding flaps** containing same assortment as No. 622-1 . . . . . " 10 95

622-1 L. **Bar-lock case** containing same assortment as No. 622-1, but the Compass with Esser's Patent Lock Joint. . . . . " 11 30

622-1 LP. Pocket Case with **folding flaps** containing same assortment as No. 622-1 L. . . . . " 11 55



No. 622-2

622-2 Bar-lock Pocket Case,
cont'g: 1 Plain Divider, 5 in., No. 606,
1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Drawing Pen, Ebony Handle, 5 in., upper blade with spring, No. 523,
1 German silver Box with Leads, No. 559 . . . . each $ 13 25

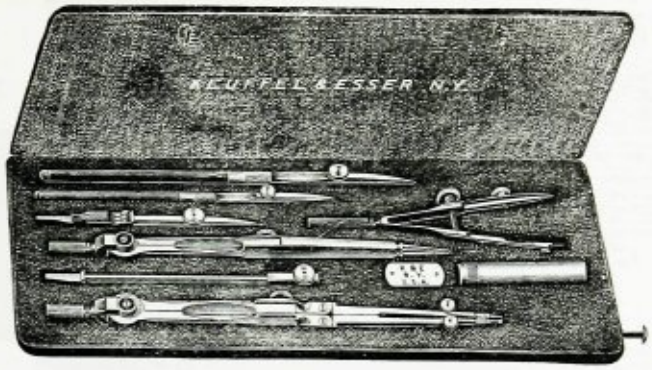
622-2 P. Pocket Case with **folding flaps** containing same assortment as No. 622-2 . . . . . " 13 50

622-2 L. **Bar-lock case** containing same assortment as No. 622-2, but the Compass and Divider with Esser's Patent Lock Joint . . . . . " 14 45

622-2 LP. Pocket Case with **folding flaps** containing same assortment as No. 622-2 L . . . . . " 14 70

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew).
For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 623-1

623-1 Bar-lock Pocket Case,
cont'g: 1 Hairspring Divider, 5 in., No. 608,
1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Steelspring Bow Pen, No. 481,
1 each, Drawing Pens 522, 523½,
1 German Silver Box with Leads, No. 559 . . . . each $ 18 20

623-1 P. Pocket Case with **folding flaps** containing same assortment as No. 623-1, ... " 18 45

623-1 L. **Bar-lock Pocket Case** containing same assortment as No. 623-1, but Compass and Divider with Esser's Patent Lock Joint . . . . . " 19 40

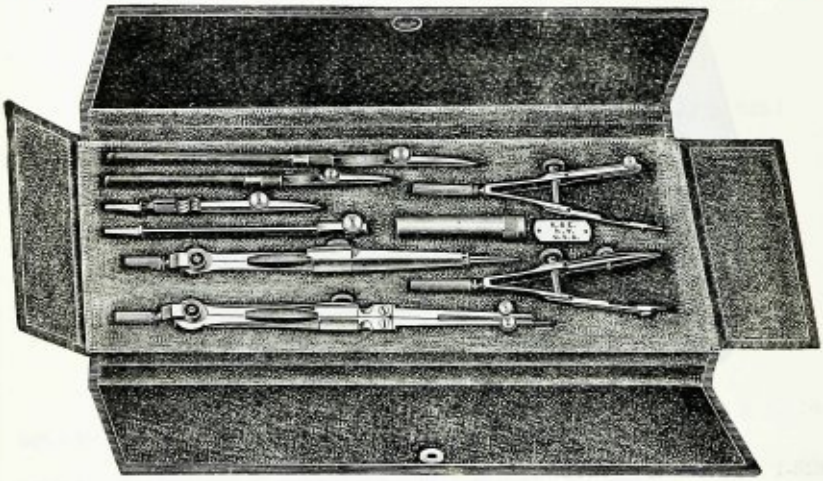
623-1 LP. Pocket Case with **folding flaps** containing same assortment as No. 623-1 L. . . . . " 19 65

Above sets with bow pen 486 (with central thumbnut) in place of No. 481, add $ 75 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew).

For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



623-3 P.

623-3 Bar-lock Pocket Case,
cont'g: 1 Hairspring Divider, 5 in., No. 608,
1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610.
1 Steelspring Bow Pen, No. 481,
1 do. Bow Pencil, No. 482,
1 Drawing Pen, Ebony Handle 4½ in., upper blade with spring, No. 522,
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½,
1 German Silver Box with Leads, No. 559 . . . . each $ 21 20

623-3 P. Pocket Case with **folding flaps** containing same assortment as No. 623-3 . . . . . " 21 45

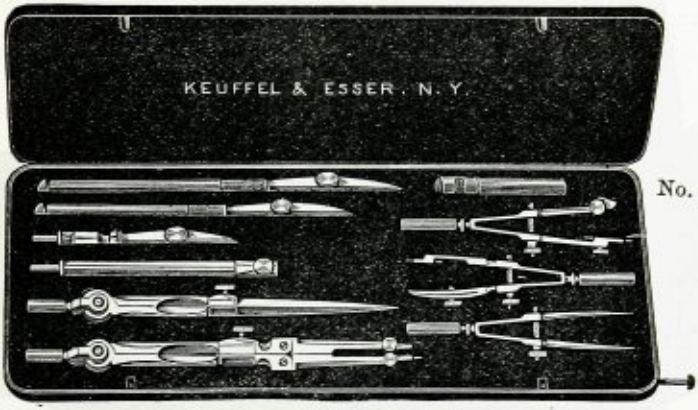
623-3 L. **Bar-lock Pocket Case** containing same assortment as No. 623-3, but Compass and Divider with Esser's Patent. Lock Joint . . . . . " 22 40

623-3 L P. Pocket Case with **folding flaps** containing same assortment as No. 623-3 L. . . . . " 22 65

Above sets with bows No. 486, 487, (with central thumbnut) in place of No. 481, 482, add $ 1 50 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew). For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



"Copyright, 1914, by Keuffel & Esser Co."

No. 624.

624. Bar-lock Pocket Case,
cont'g: 1 Hairspring Divider, 5 in , No. 608,
1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Steelspring Bow Divider, 3½ in., No. 480.
1 do. Bow Pen, 3½ " 481.
1 do. Bow Pencil, 3½ " 482.
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522.
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½.
1 German Silver Box with Leads, No. 559. . . . . each $ 23 50

624 L. Bar-lock Pocket Case,
cont'g: same assortment as No. 624, but the Compass and Divider, with Esser's Patent Lock Joint " 24 70

624 B. Bar-lock Pocket Case,
cont'g: same assortment as No. 624, but with addition of Detail Drawing Pen, 6 in., upper blade with spring, flat Ebony Handle, No. 558-2 " 25 40

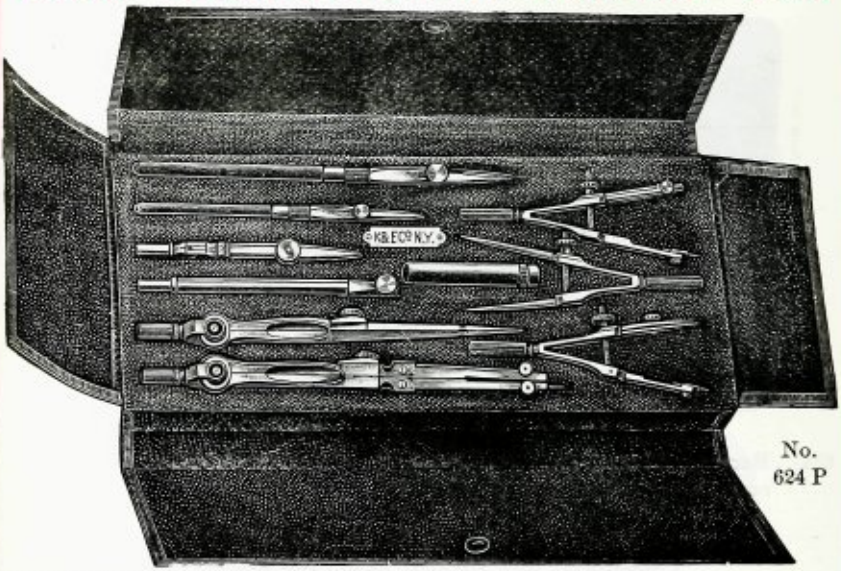
624 LB. Bar-lock Pocket Case,
cont'g: same assortment as No. 624L, but with addition of Detail Drawing Pen 6 in., upper blade with spring, flat Ebony Handle No. 558-2 . " 26 60

Above sets with spring bows No. 485, 486, 487, (central thumbnut) in place of No. 480, 481, 482, add $2 10 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew).

For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 624 P

624 P. Pocket Case with folding flaps,
cont'g: 1 Hairspring Divider, 5 in., No. 608,
1 Compass, 6 in., with fixed Needle Point Pen, Pencil Point and Lengthening Bar, No. 610.
1 Steelspring Bow Divider, 3½ in. No. 480,
1 do. Bow Pen, 3½ " 481,
1 do. Bow Pencil, 3½ " 482,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522,
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½,
1 German silver Box with Leads, No. 559 . . . each $ 23 80

624 LP. Pocket Case with folding flaps,
cont'g: same assortment as No. 624 P., but Compass and Divider with Esser's Patent Lock Joint. " 25 00

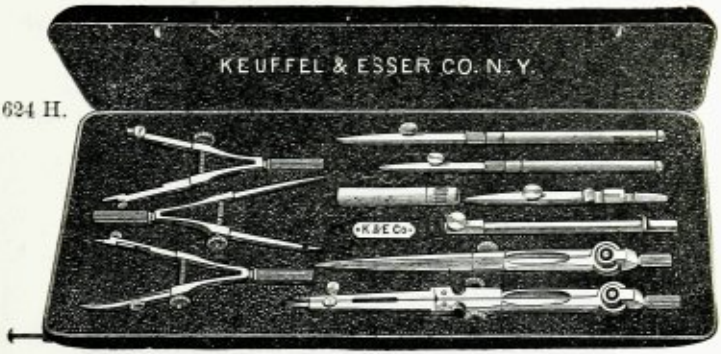
624 BP. Pocket Case with folding flaps,
cont'g: same assortment as No. 624 P, but with addition of Detail Drawing Pen, 6 in., upper blade with spring, flat Ebony Handle, No. 558-2 . . . . . " 25 70

624LBP. Pocket Case with folding flaps,
cont'g: same assortment as No. 624 LP, but with addition of Detail Drawing Pen, 6 in., upper blade with spring, flat Ebony Handle No. 558-2 . . " 26 90

Above sets with spring bows No. 485, 486, 487, (central thumbnut) in place of 480, 481, 482, add $2 10 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew). For empty cases for instruments see page 140.

No. 624 H.



624 H. Bar-lock Pocket Case,
cont'g: 1 Hairspring Divider, 5 in., No. 608.
1 Compass, 6 in., fixed Needle Point with Hairspring, Pen, Pencil Point and Lengthening Bar, No 610 H,
1 Steelspring Bow Divider, 3½ in., No. 480,
1 do. Bow Pen, 3½ " 481,
1 do. Bow Pencil, 3½ " 482,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522,
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½,
1 German Silver Box with Leads, No. 559. . . each $ 24 50

624 H P. Pocket Case with **folding flaps** containing same assortment as No. 624 H . . . . . " 24 80

624 H L. **Bar-lock case** containing same assortment as No. 624 H, but the Compass and Divider with Esser's Patent Lock Joint . . . . . " 25 70

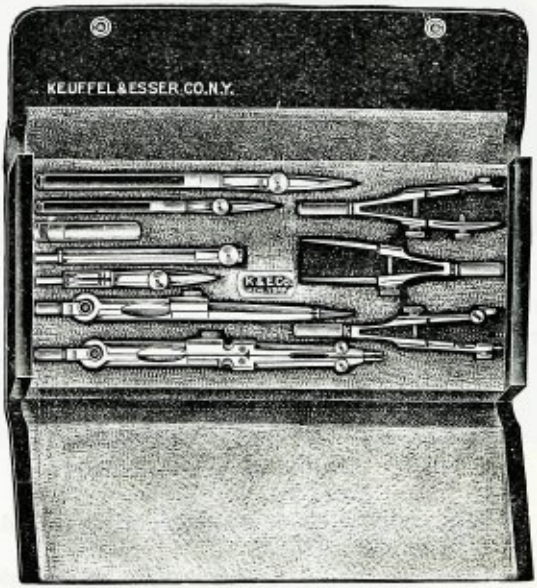
624 H L P. Pocket Case with **folding flaps**, containing same assortment as No. 624 H L . . . . . " 26 00

Above sets with spring bows No. 485, 486, 487 (central thumbnut) in place of 480, 481, 482, add $2 10 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew.)

For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



IMPROVED POCKET CASE WITH FOLDING COVER AND POCKET.

SETS 624 P., 624 B P., 624 H P.,
624 L P., 624 L B P., 624 H L P.,

CAN BE FURNISHED ALSO WITH IMPROVED CASE WITH POCKET IN FLAP, AT THE SAME PRICE AS IN REGULAR POCKET CASE WITH FOLDING FLAPS.

These improved Pocket Cases have strong leather covered ledges on the short sides, in place of the end flaps. The cover contains a pocket to hold protractors, triangles, etc. They are practical, strong and durable and occupy less space when open for use than the usual style of pocket cases with folding flaps.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

624 D. Bar-lock Case with recessed and partitioned lid with hinged cushion. The lid is arranged for holding pencils, penholders, pens, tacks, rubber, pencil pointer, India Ink, etc.; (which are shown in cut No. 624 D L but are not included in price),
cont'g: 1 Hairspring Divider, 5 in., No. 608,
1 Compass, 6 in., fixed Needle Point with Hairspring, Pen, Pencil Point and Lengthening Bar, No. 610 H,
1 Set Steelspring Divider and Bows, 3½ inch, Nos. 480, 481, 482.,
1 each Drawing Pen, Ebony Handle, Nos. 522, 523½,
1 German Silver Box with Leads, No. 559 . . . . each $25 50

624DB. Bar-lock Case with recessed lid containing same assortment as No. 624 D, but with addition of Detail Drawing Pen, 6 in., upper blade with spring, flat Ebony Handle No. 558-2 . . . . . " 27 40

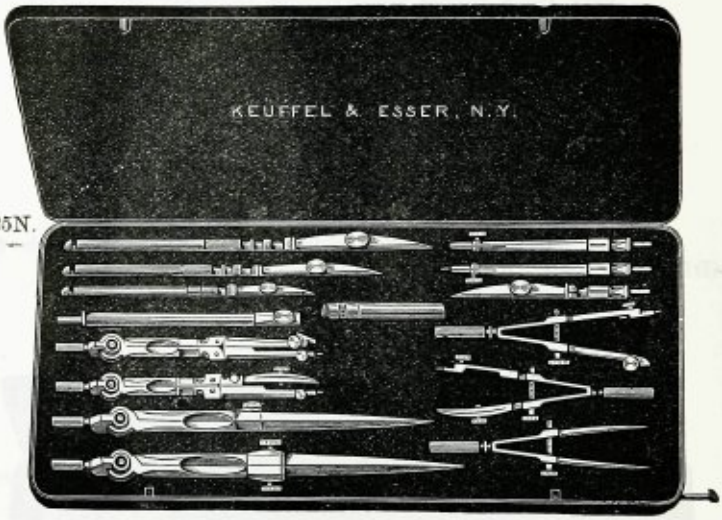


No. 624DL.

624 D L. Bar-lock Case, with recessed lid, like No. 624 D, cont'g: the same assortment as No. 624D, but Compass and Divider with Esser's Patent Lock Joint . . . . . each $26 70

Above sets with spring bows Nos. 485, 486, 487, (central thumbnut) in place of 480, 481, 482, add $2 10 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew). For empty cases for instruments see page 140.



No. 625N.

"Copyright, 1894, by Keuffel & Esser Co."

625 N. Bar-lock Pocket Case,
cont'g: 1 Hairspring Divider, 5 in., No. 608,
1 Compass, 6 in., with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar, No. 612,
1 Compass 3½ in., fixed Needle and Pen Point, No. 604,
1 do. 3½ " " " " Pencil " " 605,
1 Steelspring Bow Divider, 3½ in., No. 480,
1 do. Bow Pen, 3½ " 481,
1 do. Bow Pencil, 3½ " 482,
1 Drawing Pen with Joint, Ivory Handle, 4 in., No. 526,
1 Drawing Pen with Joint and Pin, Ivory Handle, 4¾ in., No. 527,
1 Drawing Pen with Joint and Pin, Ivory Handle, 5½ in., No. 528,
1 German Silver Box with Leads, No. 559 . . . . each $ 37 00

625 NP. Pocket Case with **folding flaps**, containing same assortment as No. 625 N, ... " 37 50

Above sets with spring bows, No. 485, 486, 487 (central thumbnut) in place of 480, 481, 482, add $2 10 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew). For empty cases for Instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO. or K. & E. CO., N. Y. Paragon.

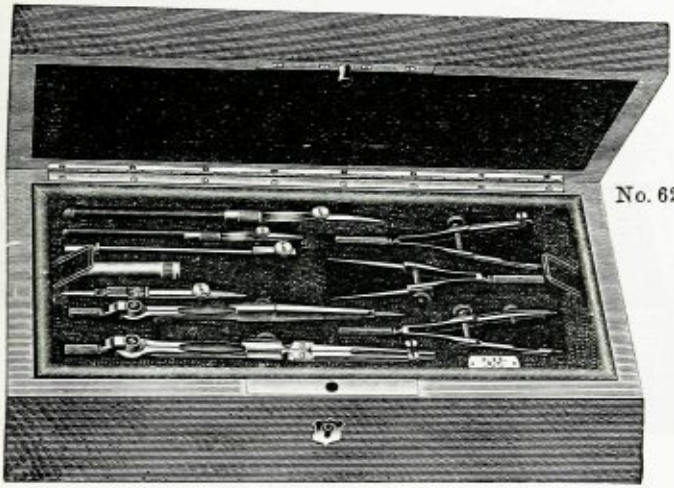
PARAGON INSTRUMENTS

WITH

ESSER'S PATENT PIVOT JOINT

(Patented, March 14, and 28, 1893.)

In polished Mahogany Cases, Tray lined with Silk Velvet, with Lock.



No. 626.

626. Polished Mahogany Case, Tray lined with Silk Velvet, with Lock, cont'g: 1 Hairspring Divider, 5 in., No. 608,
1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Steelspring Bow Divider, 3½ in., No. 480,
1 do. Bow Pen, 3½ " 481,
1 do. Bow Pencil, 3½ " 482,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No. 522,
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½,
1 German Silver Box with Leads, No. 559, ... each 26 70

626 L. Polished Mahogany Case, Tray lined with Silk Velvet, with Lock, cont'g: same assortment as No. 626, but Compass and Divider, with Esser's Patent Lock Joint . . . . each 27 90

Above sets with spring bows, No. 485, 486, 487, (central thumbnut) in place of 480, 481, 482, add $2 10 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew).
For empty cases for instruments see page 140.

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.



No. 628.

628. Polished Mahogany Case, Tray lined with Silk Velvet, with Lock, cont'g: 1 Hairspring Divider, 5 in., No. 608,
1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 610,
1 Proportional Divider, No. 435,
1 Minute Beam Compass, with 2 Steel Points, Pen, Pencil and Needle Point, No. 509,
1 Steelspring Divider, 3½ in., No. 480,
1 do. Bow Pen, 3½ " 481,
1 do. Bow Pencil, 3½ " 482,
1 Drawing Pen, Ebony Handle, 4¾ in., upper blade with spring, No. 522,
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½
1 Improved Curve Pen, 4¾ in., No. 696,
1 Horn Centre with German Silver Rim, No. 2691,
1 German Silver Box with Leads, No. 559 . . . . . each $ 48 80

628 L. Polished Mahogany Case, Tray lined with Silk Velvet, with Lock, containing same assortment as No. 628, but Compass and Divider with Esser's Patent Lock Joint . . . . . " 50 00

Above sets with spring bows, No. 485, 486, 487, (central thumbnut) in place of 480, 481, 482, add $2 10 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew).

For empty cases for instruments see page 140

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

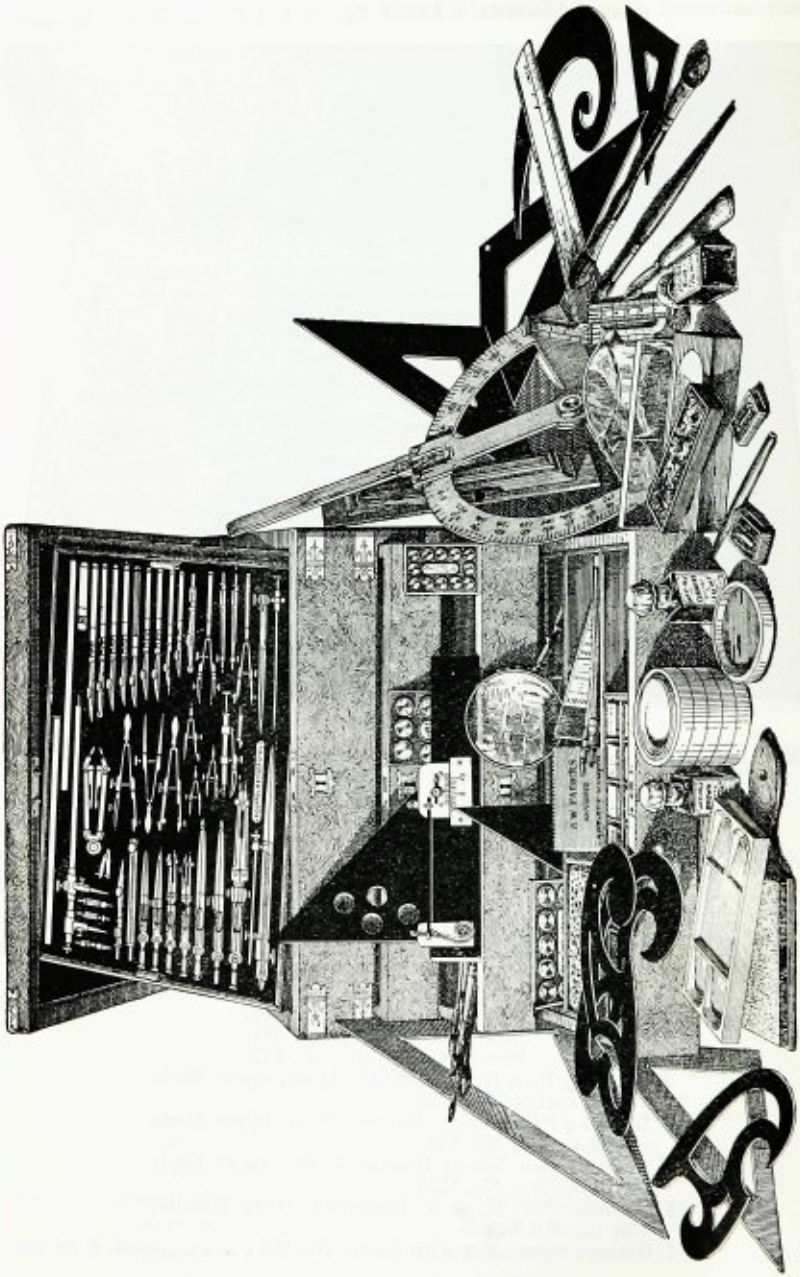


No. 630.

630. Polished Mahogany Case, Tray lined with Silk Velvet, with Lock, cont'g: 1 Hairspring Divider, 5 in., No. 608,
1 Compass, 6 in., with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar, No. 612,
1 Compass, 3½ in., fixed Needle and Pen Point, No. 604,
1 Compass, 3½ in., fixed Needle and Pencil Point, No. 605,
1 Proportional Divider, No. 437,
1 Tubular Beam Compass, 18 in., 2 round German Silver Bars, 2 Steel Points, Pen, Pencil and Needle Point, No. 500.
1 Steelspring Divider, 3½ in., No. 480,
1 " Bow Pen, 3½ in., " 481,
1 " Bow Pencil, 3½ in., " 482,
1 Drawing Pen, Ebony Handle, 4½ in., upper blade with spring, No, 522,
1 Drawing Pen, Ebony Handle, 5 in., upper blade with spring, No. 523,
1 Drawing Pen, Ebony Handle, 5½ in., upper blade with spring, No. 523½,
1 Railroad Pen, K & E improved, Ivory Handle, 5½ in., No. 545,
1 German Silver Box with Leads, No. 559 . . . . . each $ 69 00

Above set with spring bows, No. 485, 486, 487 (central thumbnut) in place of 480, 481, 482, add $2 10 per set.

See note at top of page 88: Insertion pieces with round shaft (no thumbscrew).
For emply Cases for Instruments see page 140.



No. 634.

634. Magazine Case, Polished Hardwood, Tray lined with Silk Velvet, three Drawers with Locks, ornamental Metal Corners, Bands, Hinges, Escutcheons and Name-Plate,

cont'g: 1 Plain Divider, 5 in., with Patent Lock Joint, No. 616,
1 Hairspring Divider, 6 in., No. 609,
1 Compass with Patent Lock Joint, 6 in., fixed Needle Point, with Hairspring, Pen, Pencil Point, Lengthening Bar, Dotting Pen, No. 618 H D,
1 Hairspring Divider with Patent Lock Joint, 3½ in., No. 614,
1 Plain Divider, with Patent Lock Joint, 3½ in., No. 613,
1 Compass with Patent Lock Joint, 3½ in., with fixed Needle and Pen Point, No. 615-1,
1 Compass with Patent Lock Joint, 3½ in., with fixed Needle and Pencil Point, No. 615-2,
1 Pocket Compass, No. 427,
1 Three-legged Divider, one leg adjustable, No. 431,
1 Proportional Divider with Micrometer Adjustment, No. 441,
1 Drop Spring Bow Pen and Pencil, No. 454,
1 Set Steelspring Divider and Bows, No. 460, 461, 462,
1 " " do. " do. No. 476, 477, 478,
1 Tubular Beam Compass, 36 in., No. 502,
1 Patent Paragon Pen 5 in., Ebony Handle, No. 533,
1 Drawing Pen, 4 in. with Joint, Ivory Handle, No. 526,
2 do. 4¾ " " " and Pin, Ivory Handle, No. 527,
2 do. 5½ " " " " " " " " 528,
1 do. 6½ " " " " " " " " 529,
1 Railroad Pencil, 5 in., Ivory Handle, No. 543,
1 " Pen, 5½ in., Ivory Handle, No. 544,
1 Improved Dotting Pen, 6 in., Ivory Handle, No. 551,
1 Pricker, Ivory Handle, No. 557,
1 Adjusting Key and Screwdriver, No. 825,
1 German Silver Box with Leads, No. 559
1 Casey's Section Liner, No. 1157,
1 Protractor with Arm and Vernier, No. 1226,
1 Set (8) Paragon Scales like No. 1576 P, 1 Ivory Scale Rule, No. 1720,
1 German Silver Parallel Rule, No. 1751,
1 Set Xylonite Lettering Triangles, No. 1859.
1 each do. Triangle, No. 1855, 5, 8, 12 in.,
1 " do. do. " 1856, 4, 7, 10 " " "
1 " do. Curve, No. 1860—4, 13, 19 and No. 1861 (Spiral),
1 " Steel Triangle No. 2002, 10½ in., No. 2003, 8 in.,
2 doz. each G. S. Tacks, No. 2622, 2626, 1 doz; Steel Tacks, No. 2600,
1 Tacklifter, No. 2680, 2 Horn Centres, No. 2691,
1 Set (18) Full Pans Technical Colors, No. 2900 and 2901,
1 Set of 6 Columbia Drawing Inks, 1 Cake India Ink, No. 3031, XII.
1 doz. Brushes, No. 3102, 1 each Brush, No. 3123, 1, 2,
1 each Brush, No. 3120, 1, 2, 4, 6, 8, 10, 14, 18, 22,
1 " do. " 3133, 0, 3, No. 3135, 1, 3,
1 Slate Ink Slab, No. 3153, 1 Nest of Saucers, No. 3161,
1 Centre Slab, No. 3183, 1 Water Glass, No. 3187,
1 doz. each Pens, No. 3200, 3202, 1 each Penholder, No. 3220, 3221,
6 Artist Pencils, No. 3361, 6 Boxes Leads, No. 3370,
1 Cake Sponge Rubber, No. 3408,
2 Cakes Alba Rubber, No. 3415, 1 each Ink Erasers, No. 3418, 3419
1 Pencil Pointer, No. 3507, 1 Steel Eraser, No. 3480,
1 Reading Glass, No. 6970, 3 in., ... each $ 300 00

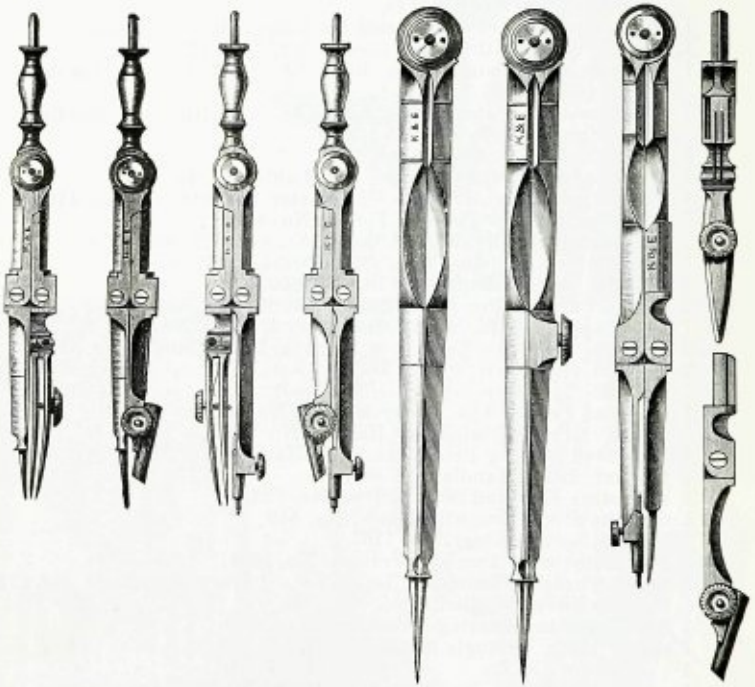
See note at top of page 88: Insertion pieces with round shaft (no thumbscrew).

For empty cases for instruments see page 140.

ENGLISH INSTRUMENTS.

GERMAN SILVER, FINE FINISH, DOUBLE SECTOR-JOINT.

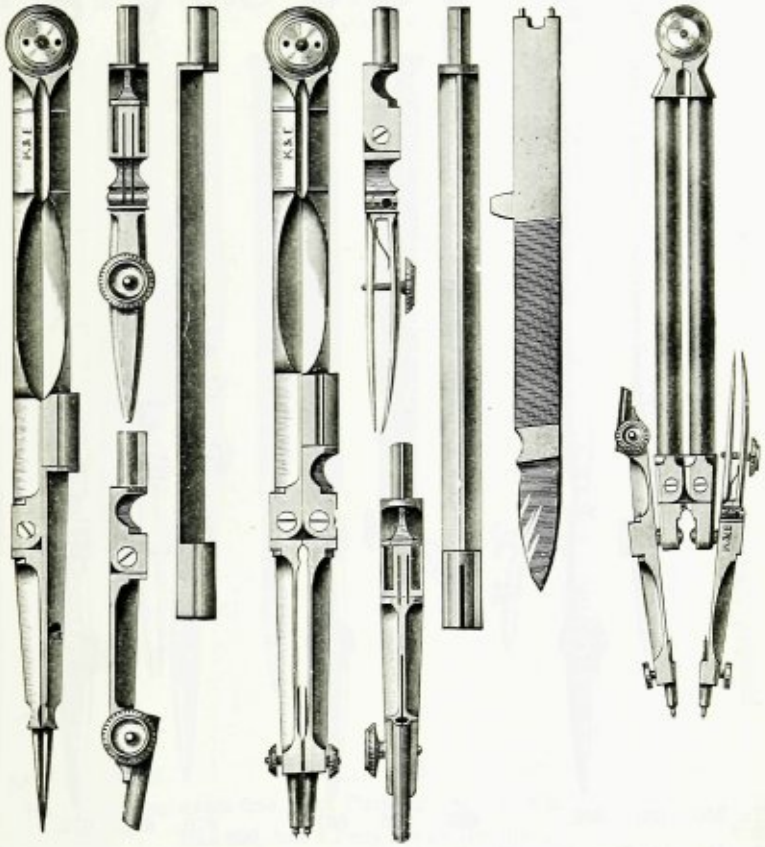
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No. 640. 641. 642. 643. 644. 646. 650.

640.	Bow Pen, 3½ in.	each	$ 3 50
641.	Bow Pencil, 3½ in.	"	3 50
642.	Bow Pen with Needle Point, 3½ in.	"	4 30
643.	Bow Pencil " " " 3½ "	"	4 30
644.	Dividers, 5 in.	"	2 15
646.	Hairspring Dividers, 5 in.	"	3 25
650.	Compasses, 5½ in., with Joint in each leg, fixed Needle Point, Steel, Pen and Pencil Point	"	10 75

"Copyright, 1897, by Keuffel & Esser"



No. 651. 652. 653.

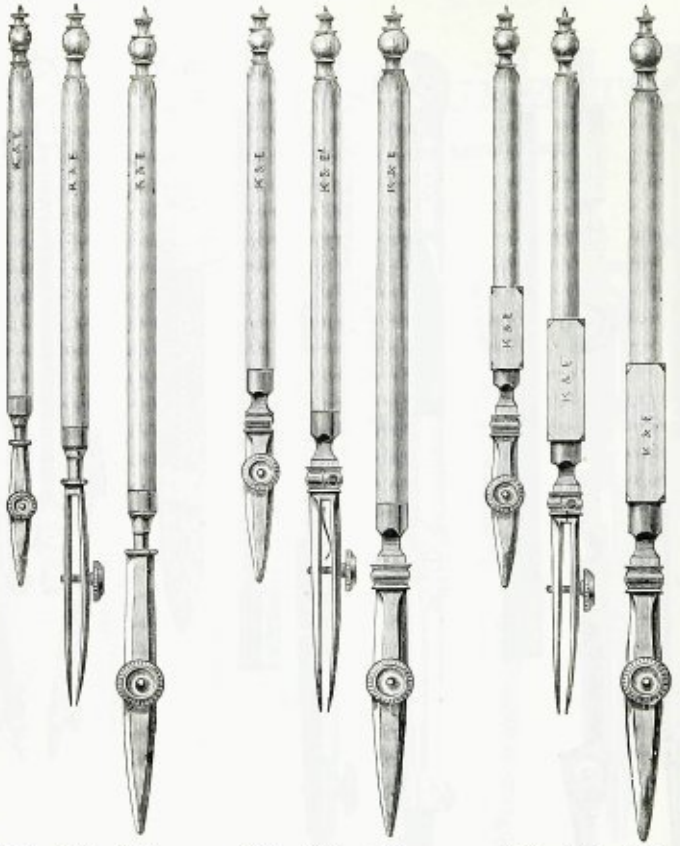
651. Compasses, 6 in., with one fixed and one movable Steel Point, Pen, Pencil Point, Lengthening Bar and Knife Key . . . . . each $ 10 75

652. do. 6 in., with Joint in each leg, Pen, Pencil, 2 Needle Points, Lengthening Bar and Knife Key . . . . . " 14 50

653. Tubular Compasses, with improved Slide Bar, Pen, Pencil and 2 Needle Points, (lengthens to 9½ in.) " 16 10

ENGLISH DRAWING PENS.

"Copyright, 1887, by Keuffel & Esser."



No. 660. 661. 662. 665. 666. 667. 670. 671. 672.

660.	Drawing Pen, Ivory Handle, $4\frac{1}{2}$ in.	each	$	1 35
661.	do. " " $5\frac{1}{4}$ "	"		1 45
662.	do. " " 6 "	"		1 60
665.	Drawing Pen with Joint, Ivory Handle, $4\frac{1}{2}$ in.	"		1 60
666.	do. " " " " $5\frac{1}{2}$ "	"		1 90
667.	do. " " " " $6\frac{1}{4}$ "	"		2 15
670.	Drawing Pen with Joint, square Ivory Handle, $4\frac{1}{2}$ in. . .	"		1 90
671.	do. " " " " " $5\frac{1}{2}$ " . . .	"		2 15
672.	do. " " " " " $6\frac{1}{4}$ " . . .	"		2 45

Steelspring Dividers and Bows Nos. 460 to 487 match the above.

CASES FOR ENGLISH INSTRUMENTS

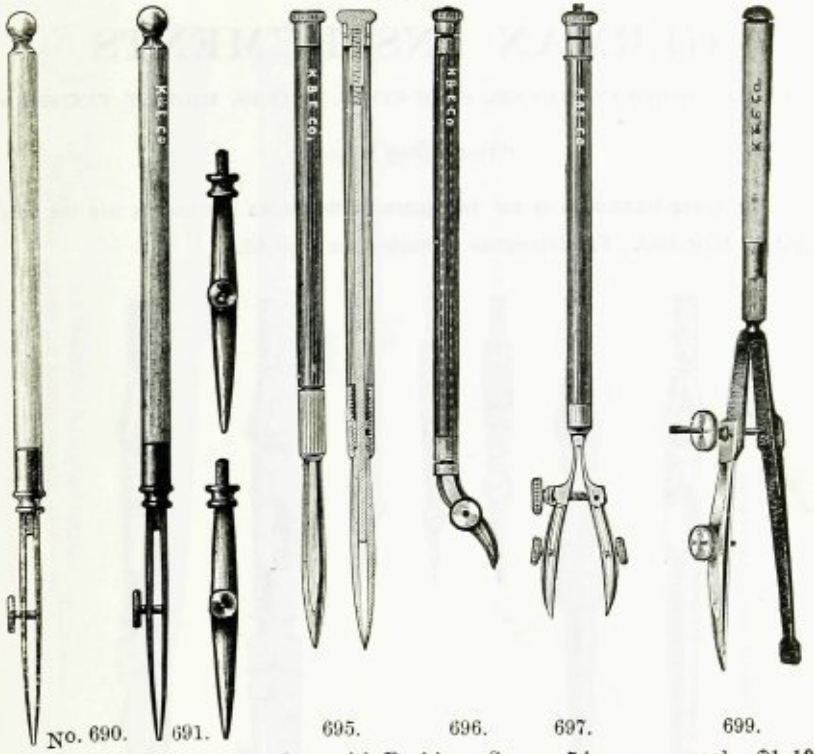
to contain any of the above Instruments, also Scales, Colors, Brushes, etc., made to order.

For EMPTY CASES see page 140

Each instrument stamped KEUFFEL & ESSER CO., or K. & E. CO., N. Y. Paragon.

IMPROVED DRAWING PENS.

PARAGON



No. 690. 691. 695. 696. 697. 699.

690. Hatching Pen, extra fine, with Pushing Screw, 5 in. . . . each $1 10

691. do. like 690, but 3 Pens to one Handle. . . . . " 2 60

695. Improved Drawing Pen, 5¼ in., without Thumb-screw . . " 1 45

This pen opens and closes by turning the set-screw at the upper end of the handle, avoiding the screw through the blades and preventing displacement of the nibs sideways. As there is no obstruction to the sight in working, this pen is preferable for fine work.

696. Improved Curve Pen, 4¾ in. . . . . each $ 1 50

This pen has a hollow handle in which a thin rod rotates. The blades being fastened to the end of the rod and being eccentric to it, turn easily and follow the smallest curve with precision. By means of a nut at the upper end of the rod, the pen can be clamped and may then be used as a regular drawing pen.

697. Improved Railroad Pen, 5¼ in. . . . . each $ 4 25

The construction of this pen is like that of No. 696 with the exception of its having two pair of blades.

These improved pens, have been extensively imitated in inferior qualities. Insist on obtaining the Paragon brand.

699. Spline Pen, Ivory Handle, 5 in. . . . . each $ 3 00

Spline Pen No. 699 is a steelspring bow pen, the other shank of which ends in a flat lug. Applying this lug against splines, etc., prevents blotting from contact of the pen point with the spline. The bow facilitates locating the line in the correct place without shifting the spline.

For other Paragon Pens see page 71 etc.

Each instrument stamped with trade-mark

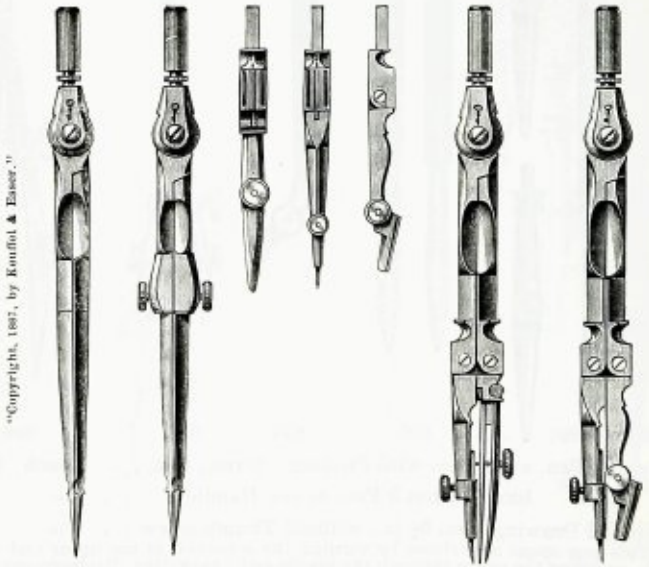
EXTRA FINE

GERMAN INSTRUMENTS

OF BEST GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED

"TRADE MARK."

The above trade-mark is our full guaranty that these instruments are the very best of their kind. For description of quality see page 46.



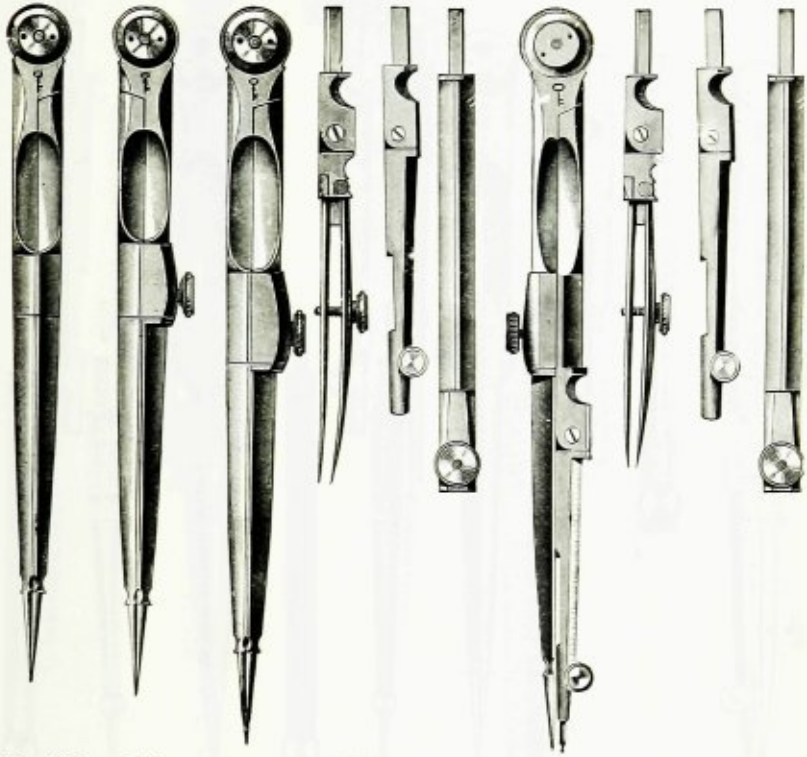
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No. 700. 702. 704. 705.

700.	Plain Dividers, 3½ in., with Handle	each	$ 1	00
702.	Compasses, 3½ in., with 2 Steel Points, Pen, Pencil and Needle Point	"	2	80
703.	do. 3½ " like No. 702 but with **Lengthening Bar**	"	3	05
704.	do. 3½ " with fixed Needle and Pen Point . .	"	2	15
705.	do. 3½ " " " " " Pencil Point .	"	2	15

For Brand instruments with Pivot Joint see page 122.

Each instrument stamped with trade-mark

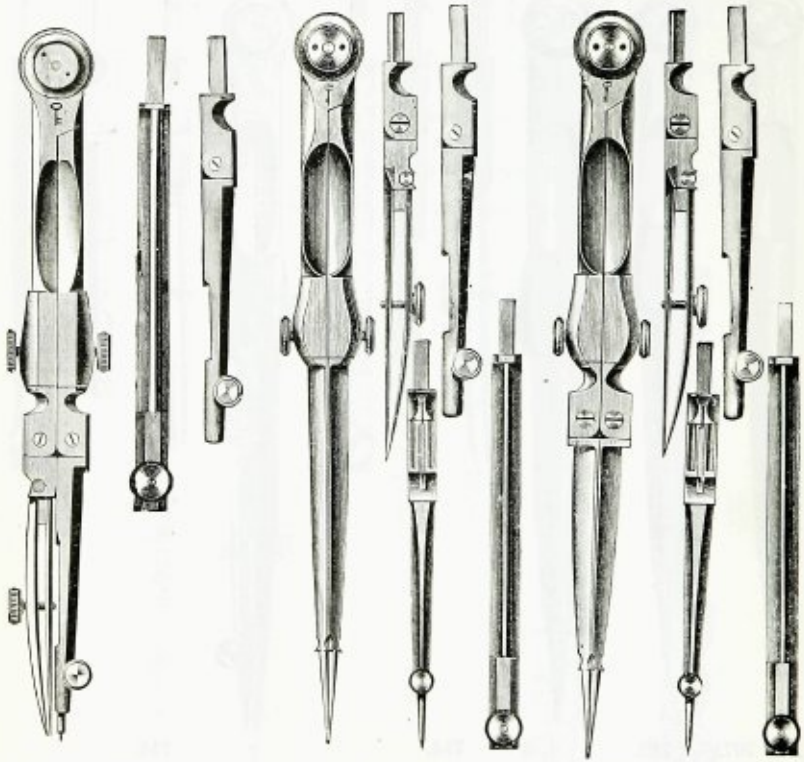


No. 707. 710. 714. 715.

706.	Plain Dividers, 4 in.	each	$ 80
707.	do. 5 "	"	85
708.	do. 6 "	"	1 00
710.	Hairspring Dividers, 5 in.	"	1 50
711.	do. 6 "	"	2 00
714.	Compasses, 5½ in., with one fixed and one movable Steel Point, Pen, Pencil Point and Lengthening Bar	"	2 50
715.	do. 5½ " with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar .	"	3 05

Brand Instruments with Pivot Joint see page 122.

Each instrument stamped with trade-mark



No. 716. 717. 718.

716. Compasses, 5½ in., with Hairspring to fixed Needle Point, Pen, Pencil Point and Lengthening Bar each $ 4 55

717. do. 5½ in., with 2 Steel Points, Pen, Pencil, Needle Point and Lengthening Bar . . . . . " 3 55

718 do. 5½ in., with 2 Steel Points with Joint, Pen, Pencil, Needle Point and Lengthening Bar " 4 40

For Brand Instruments with Pivot Joint see page 122.

Each instrument stamped with trade-mark













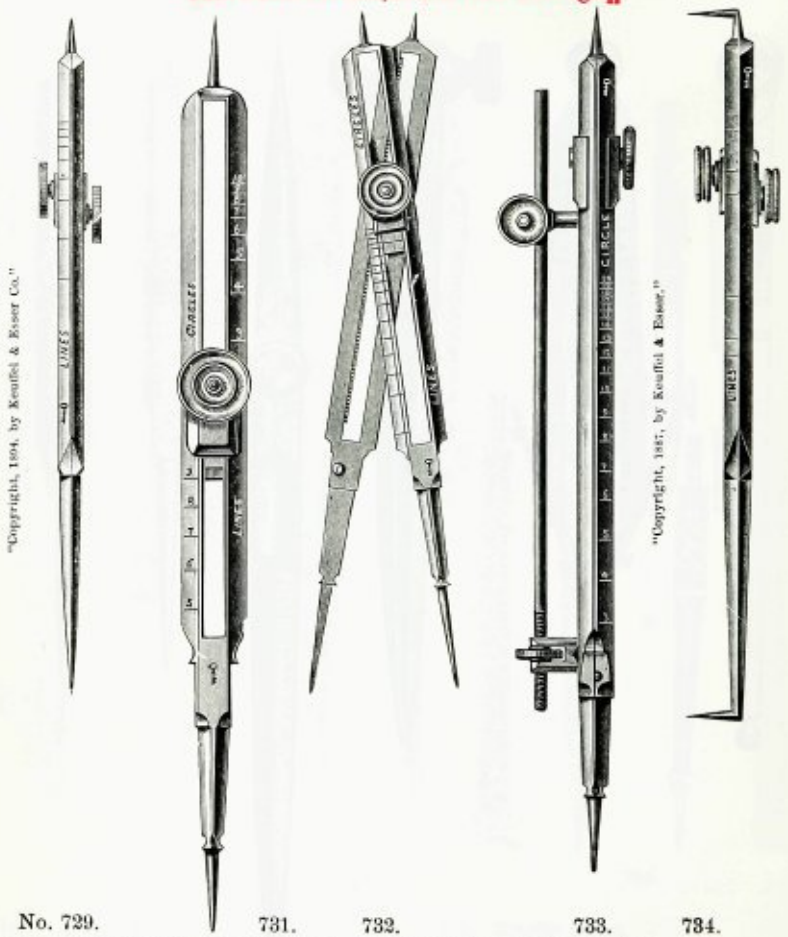
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"Copyright, 1904, by Keuffel & Esser Co."

No. 720. 721. 725. 727. 728. 728½.

720.	Pocket Dividers, 5 in., with metal Sheath	each	$ 1 60
721.	Pocket Compasses with folding Points, 4½	"	5 60
725.	Three-legged Dividers, 5 in.	"	2 95
727.	Whole and Half Dividers, 6½ in.	"	2 50
728.	Proportional Dividers, 6½ in., for lines	"	2 50
	Morocco Case for No. 728	"	70
728½.	Proportional Dividers, 7 in., for lines and circles	"	3 25
	Morocco Case for No. 728½	"	70

Each instrument stamped with trade-mark



No.			
729.	Proportional Dividers, 7 in., with Rack-Movement, for lines and circles	each	$ 5 20
	Morocco Case for No. 729	"	70
730.	Proportional Dividers, 7¼ in., for lines and circles	"	6 45
	Morocco Case for No. 730	"	70
731.	Proportional Dividers, 9½ in., for lines and circles	"	9 40
	Morocco Case for No. 731	"	1 00
732.	Proportional Dividers, 7¼ in., with Rack-Movement, for lines, circles, planes and solids	"	9 60
	Morocco Case for No. 732	"	70
733.	Proportional Dividers, 9½ in., with Micrometer Adjustment, for lines and circles	"	12 80
	Morocco Case for No. 733	"	1 00
734.	Proportional Dividers, 7¼ in., with Rack-Movement, for lines and circles, Points bent rectangular	"	10 00
	Morocco Case for No. 734	"	80

For lower-priced Proportional Dividers, see page 138.

Each instrument stamped with trade-mark

"Copyrighted, 1887, by Keuffel & Esser."



No. 739.



740.



741.



742.

739.	Large Steelspring Dividers, $5\frac{3}{4}$ in., white Handle	each	$ 2 35
740.	Steelspring Dividers, $3\frac{1}{2}$ in., German silver Handle . . .	"	1 85
741.	do. Bow Pen, $3\frac{1}{2}$ in., with Needle Point, German silver Handle	"	2 10
742.	do. Bow Pencil, $3\frac{1}{2}$ in., with Needle Point, German silver Handle	"	2 10
743.	do. Bows, set of 3, Nos. 740, 741, 742, in morocco Case	set	6 90

Steelspring Bows No. 740, 741, 742 are opened and closed by a right and left thread, which is operated by one thumbnut situated between the shanks of the instrument; this thread also holds the points rigidly and doubles the speed of the screw.

The pen of No. 741 has Spring Blade.

Each instrument stamped with trade-mark



No. 750. 751. 752.

750.	Steelspring	Dividers,	3½ in., with German Silver Handle,	each	$ 1 10
751.	do.	Bow Pen,	3½ " with Needle Point, do. do.	"	1 45
752.	do.	Bow Pencil,	3½ " " " " do. do.	"	1 45
753.	do.	Bows,	Set of 3, Nos. 750, 751, 752, in morocco Case,	set	4 80



No. 755 756. 757.

755.	Steelspring	Dividers,	4 in., white Handle, ...	each	$ 1 00
756.	do.	Bow Pen,	4 " with Needle Point, white Handle	"	1 35
757.	do.	Bow Pencil,	4 in., " " " " "	"	1 35
758.	do.	Bows,	Set of 3, Nos. 755, 756, 757, in morocco Case,	set	4 50

The pens of Nos. 751 and 756 have Spring Blade.

Each instrument stamped with trade-mark



763.



764.

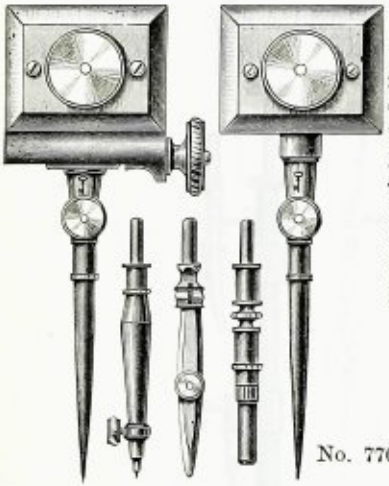
763.	Drop Spring Bow Pen, 4 in., ...	each	$ 2 00
764.	Drop Spring Bow Pen and Pencil, 4 in., ...	"	3 00
	Morocco Case, for No. 763	"	50
	Morocco Case, for No. 764	"	75

In Nos. 763, 764, a rod passes through the instrument serving as handle and needle point. This center rod remains stationary while the instrument is turned, and pen or pencil draw by their own weight avoiding the slipping of the needle or scratching of the pen.

The pens of Nos. 763 and 764 have Spring Blade.

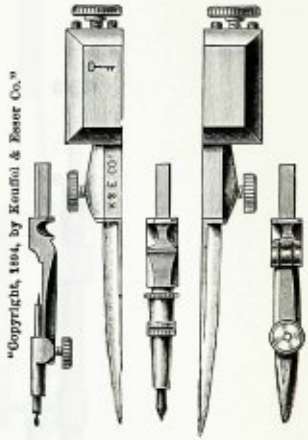
For other Drop Spring Bow Pens, see pages 61, 148.

Each instrument stamped with trade-mark



"Copyright, 1892, by Keuffel & Esser."

No. 770.



"Copyright, 1894, by Keuffel & Esser Co."

773.

770. Beam Compasses, to fit on a bar or straightedge, with 2 Steel Points, Pen, Pencil and Needle Point, with Micrometer Adjustment . . . . . each $ 7 00
Morocco Case for No. 770 . . . . . " 85

773. Beam Compasses with 2 Steel Points, Pen, Pencil, and Needle Point, with 30 in., **Hardwood Bar** . . . . . " 3 85
Morocco Case for No. 773 . . . . . " 86

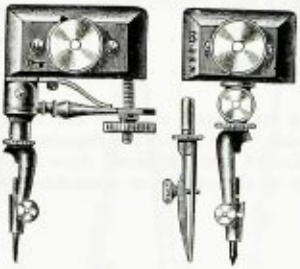


Illustration ⅜ size

"Copyright 1894, by Keuffel & Esser Co."

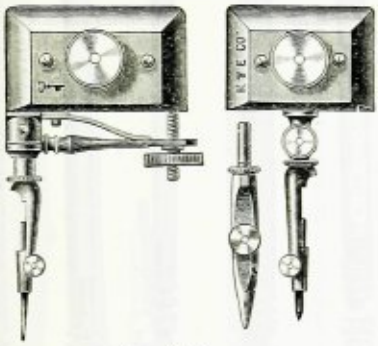
No. 771.

771. Minute Beam Compasses, to fit on a bar or straightedge, with Pen, Pencil, fixed Needle Point and Micrometer Adjustment . . . . . each $ 5 35
771½. **Wheel Attachment** for No. 771 . . . . . " 2 50
Morocco Case for No. 771 . . . . . " 85
" " " " 771 with No. 771½ . . . . . " 1 20

For Bars for Beam Compasses see page 229.

Each instrument stamped with trade-mark

Illustration ⅓ size.



No. 772.



772½.

772. Beam Compasses, to fit on a bar or straightedge, with Pen, Pencil, fixed Needle Point and Micrometer Adjustment . . . . . each $ 5 80

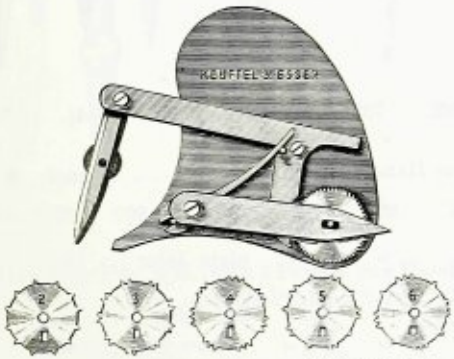
772½. Wheel Attachment for No. 772, ... " 2 50

Morocco Case for No. 772, ... " 85

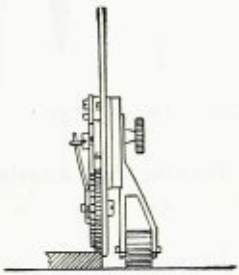
" " for No. 772 with No. 772½, ... " 1 25

For wooden bars for beam compasses see page 229.

Illustration ⅔ size.



"Copyright, 1887, by Keuffel & Esser."



Sectional View

No. 775 N.

775 N. Dotting Instrument, Improved, German silver, with 6 Wheels, in Case . . . . . each $ 6 00

The outer wheel is rolled on the edge of a T square or straightedge and turns the ratchet wheel which interrupts the contact of the pen to produce the dotting. The flat point, close to the pen slides on the paper. To change the pattern of the dotted line, throw back the spring which holds the wheel on its axle and insert the proper ratchet wheel. On the reverse side of the instrument is an adjustable support with wide roller, which prevents the slipping of the propelling wheel and facilitates maintaining proper vertical position of the instrument during use.

Each instrument stamped with trade-mark

"Copyright, 1887, by Keuffel & Esser."



No.	779.	780.	781.	782.	782½.	783.	784.	784½.	785.

779.	Drawing Pen,	Aluminum Handle,	4½	in.	. . . . .	each	$	40
780.	do.	"	5½	"	. . . . .	"		45
781.	Drawing Pen,	"	5½	"	plain Joint .	"		50
782.	Drawing Pen,	"	4½	"	fine Joint . .	"		75
782½.	do.	"	5	"	" . .	"		80
783.	do.	"	5½	"	" . .	"		85
784.	Drawing Pen,	"	4½	"	fine Joint and Pin	"		85
784½.	do.	"	5½	"	" "	"		90
785.	do.	"	6	"	" "	"		95

For Brand Drawing Pens see page 137.

Drawing Pens carefully set and sharpened . . . each $ 15 to 20

Each instrument stamped with trade-mark



"Copyright, 1881, by Keuffel & Esser."

No. 786. 792. 795. 797. 798. 799. 806. 807. 808.

786.	Hatching Pen, 5 in.,	with 3 Pens to one Handle, White Handle.	each	$ 1 50
790.	do. 6 "	with Pushing Screw, Ebony Handle, . .	"	85
791.	do. 6 "	do. 2 Pens to one Handle	"	1 30
792.	do. 6 "	do. 3 " " " "	"	1 70
795.	Drawing Pen, 5½ "	graduated Thumbscrew, Ebony Handle	"	1 80
797.	do. 5 "	with German Silver Blades, for red ink, Aluminum Handle . . .	"	70
798.	do. 5½ "	do. do. with Joint	"	90
799.	do. 5½ "	do. do. " " and Pin	"	1 10
806.	Drawing Pen, Ebony Handle, upper blade with Spring, 4½ in.,		each	75
807.	do. "	" " " " " " 5 "	"	80
808.	do. "	" " " " " " 5½ "	"	85

Aluminum Handle for Nos. 806 to 808, extra . . . each $ 10

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

Each instrument stamped with trade-mark



"Copyright, 1894, by Keuffel & Esser Co."

No. 805. 810. 812. 813. 814. 815.

805.	Railroad Pen, 5½ in. Pens with Joint, Bone Handle . . .	each	$ 2 50
810.	Dotting Pen with one Wheel, 5 in., Bone Handle	"	1 00
812.	Detail Pen, 5½ in., flat Ebony Handle	"	75
813.	do. 6½ " " " "	"	85
814.	do. 6¼ " round " "	"	1 00
815.	do. 6½ " for double lines, round Ebony Handle	"	2 00

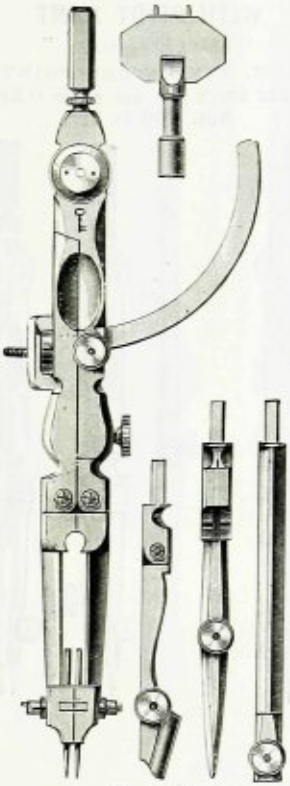
The Detail Pens are especially adapted for drawing long and heavy lines, such as occur in detail drawings, etc. They are made to hold much ink, to obviate the necessity of frequent filling.

Aluminum Handle for Nos. 812, 813, extra . . . . each $ 10

Drawing Pens carefully set and sharpened . . . . . each $ 15 to 20

Each instrument stamped with trade-mark

LITHOGRAPHIC COMPASSES.



No. 820.

820. Lithographic Compasses, German Silver, 8 in., very strong, with Arc, Set Screw and Micrometer Adjustment; with Handle, one fixed and one movable Needle Point, Pen, Pencil Point, Lengthening Bar and Wrench-key, in morocco Case . . . . . each $ 14 00

Illustrations full size.



No. 825.



830.

825. Adjusting-key and Screwdriver . . . . . each $ 35

830. Leads for Instruments, nickelplated box containing 4 Leads . . . . . " 10

Each instrument stamped with trade-mark

EXTRA FINE

GERMAN INSTRUMENTS

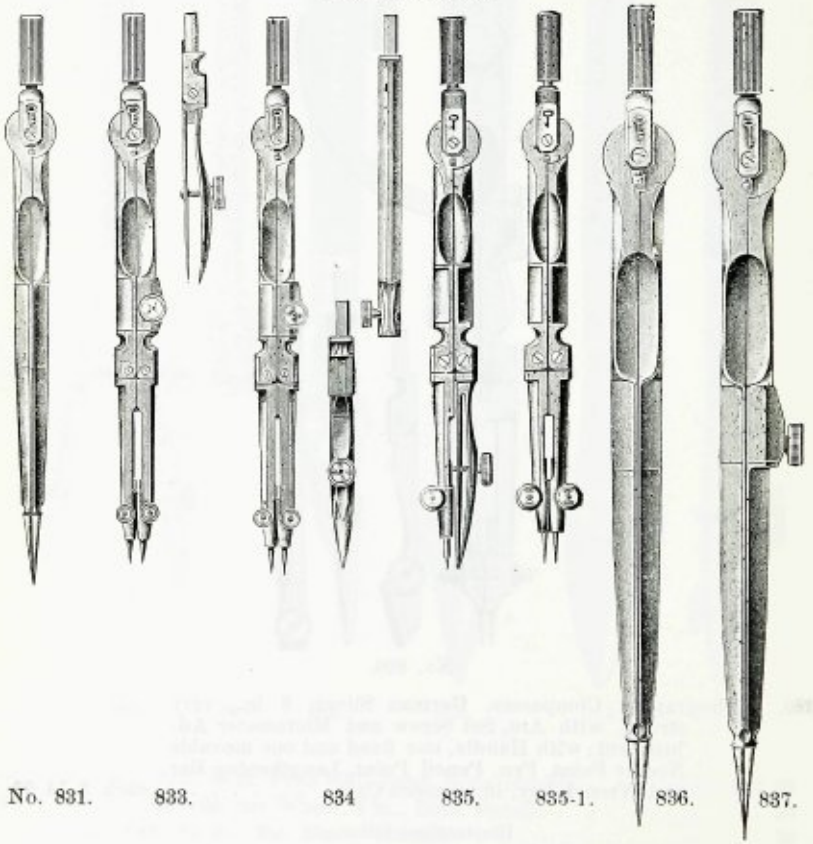
WITH PIVOT JOINT

"TRADE MARK."

OF BEST GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED

Workmanship, quality and finish like our other "Key" Brand Instruments

Nos. 700 to 820.

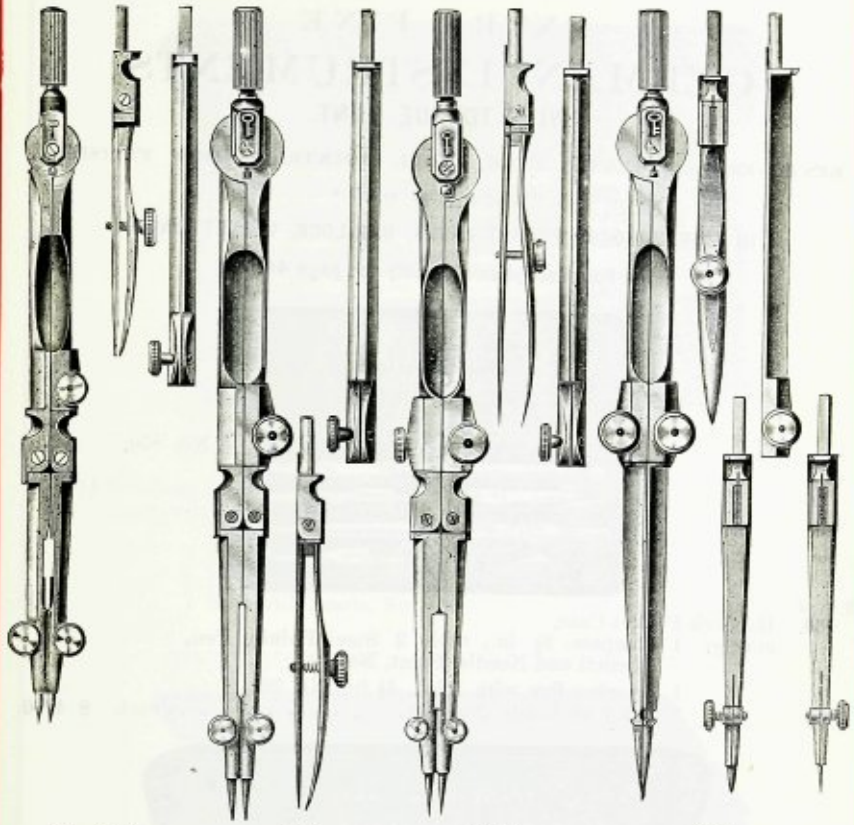


No. 831. 833. 834 835. 835-1. 836. 837.

831.	Plain Dividers, 3½ in.	each	$ 1 35
833.	Compasses, 3½ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, 2 Shouldered Needles	"	3 60
834.	Compasses, 3½ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, Lengthening Bar, 2 Shouldered Needles	"	4 00
835.	Compasses, 3½ in., fixed Needle Point, and Pen Point with spring blade	"	2 75
835-1.	Compasses, 3½ in., fixed Needle Point and Pencil Point	"	2 75
836.	Plain Dividers, 5½ in.	"	1 50
837.	Hairspring Dividers, 5½ in.	"	2 20

For sets containing above instruments, see page 127.

Each instrument stamped with trade-mark



No. 838½. 838. 838H. 839.

838½. Compasses, 4½ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, Lengthening Bar, 2 Shouldered Needles . . . . . each $ 4 25

838. Compasses, 5½ in., fixed Needle Point, Pen Point with spring blade, Pencil Point, Lengthening Bar, 2 Shouldered Needles . . . . . " 4 50

838H. Compasses, 5½ in., Hairspring to fixed Needle Point, Pen Point with spring blade, Pencil Point and Lengthening Bar, 2 Shouldered Needles . . . . . " 5 10

839. Compasses, 5½ in., 2 Steel Points, Pen Point with spring blade, Pencil Point, Needle Point, Lengthening Bar, 2 Shouldered Needles . . . . . " 5 10

For sets containing above instruments see page 127.

Each instrument stamped with trade-mark

EXTRA FINE
GERMAN INSTRUMENTS
WITH TONGUE JOINT.

BEST GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED,

"TRADE MARK"

IN FINE MOROCCO POCKET CASES, BAR-LOCK, VELVET LINED.

For description of quality see page 48.



Copyright, 1882, by Keuffel & Esser.

No. 850.

850. Bar-lock Pocket Case,
cont'g: 1 Compass, 3½ in., with 2 Steel Points, Pen, Pencil and Needle Point, No. 702,
1 Drawing Pen with Joint, 4½ in., No. 782,
1 Box with Leads, No. 830 . . . . . each $ 4 60

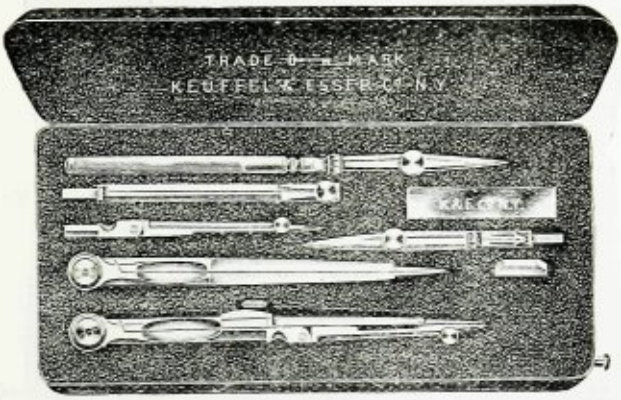


No. 851.

851. Bar-lock Pocket Case,
cont'g: 1 Compass, 5 in., with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar, No. 715,
1 Drawing Pen with Joint and Pin, 6 in., No. 785,
1 Box with Leads, No. 830 . . . . . each $ 5 25

For Sets of Brand Instruments with Pivot Joint see page 127.

Each instrument stamped with trade-mark



No. 851½

851½ Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar, No. 715,
1 Divider, 5 in., No. 707,
1 Drawing Pen with Joint and Pin, 6 in., No. 785,
1 Box with Leads, No. 830. . . . . each $ 6 25



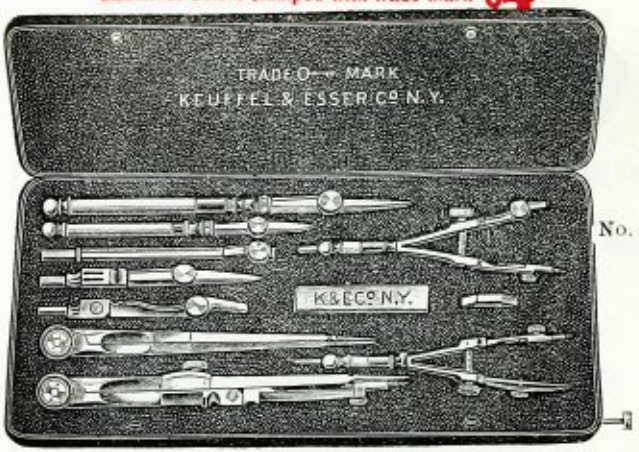
"Copyright, 1887, by Keuffel & Esser"

No. 852

852. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Steel, Pen, Pencil Point and Lengthening Bar, No. 715,
1 Divider, 5 in., No. 707,
1 Steelspring Bow Pen, with Needle Point, No. 756,
1 Drawing Pen with Joint, 4½ in. No. 782,
1 do. " " and Pin, 6 in. No. 785,
1 Box with Leads, No. 830 . . . . . each $ 8 60

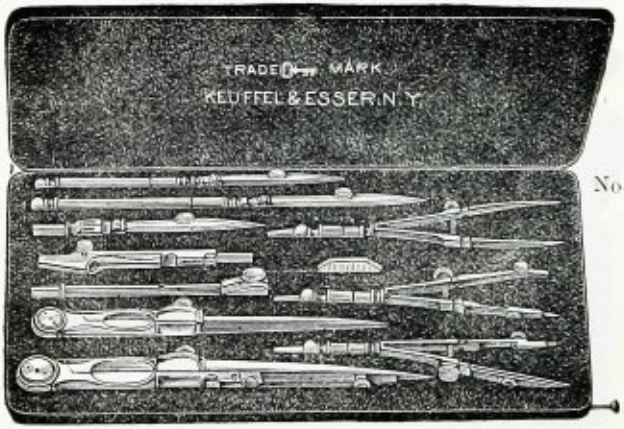
For Sets of Brand Instruments with Pivot Joint, see page 127.

Each instrument stamped with trade-mark



No. 853.

853. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Steel Pen, Pencil Point and Lengthening Bar, No. 715,
1 Divider, 5 in., No. 707,
1 Steelspring Bow Pen, with Needle Point, No 756,
1 Steelspring Bow Pencil, with Needle Point, No. 757,
1 Drawing Pen with Joint, 4½ in , No. 782,
1 do. " " and Pin, 6 in , No. 785,
1 Box with Leads, No. 830 . . . . . each $10 35



No. 854N.

"Copyrights, 1881, by Keuffel & Esser."

854N. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Steel Pen, Pencil Point and Lengthening Bar, No. 715,
1 Hairspring Divider, 5 in., No 710,
1 Steelspring Divider, No. 755,
1 " Bow Pen, with Needle Point, No. 756,
1 " Bow Pencil, with Needle Point, No. 757,
1 Drawing Pen with Joint, 4½ in., No. 782,
1 do. " " and Pin, 6 in., No. 785,
1 Box with Leads, No. 830 . . . . . each $ 12 00

For Sets of Brand Instruments with Pivot Joint, see page 127.

Each instrument stamped with trade-mark

EXTRA FINE
GERMAN INSTRUMENTS
WITH PIVOT-JOINT.

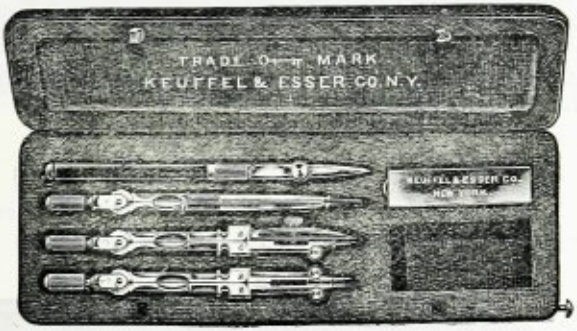
BEST GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED.

"TRADE MARK."

IN FINE MOROCCO POCKET CASES, VELVET LINED,

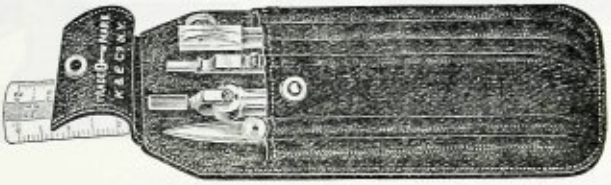
with Bar Lock or with Folding Flaps.

For description of quality see page 48.



No. 888 N.

888 N. Bar-lock Pocket Case,
cont'g: 1 Divider, 3½ in., No. 831,
1 Compass, 3½ in., with fixed Needle Point and Pen Point, No. 835,
1 Compass, 3½ in., with fixed Needle Point and Pencil Point, No. 835-1,
1 Drawing Pen, Ebony Handle, upper blade with spring, 4½ in., No. 806,
1 Box with Leads, No. 830 . . . . . each $ 9 00

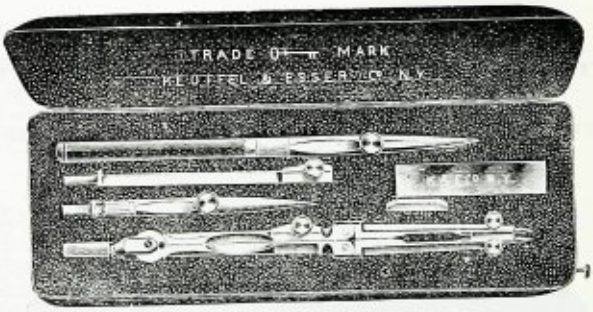


No. 889 N.

889N. Vest Pocket Set, **sewed leather Pouch,** about 2½ × 7 in., with flap and button catch,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Drawing Pen, 5 in., Ebony Handle, upper blade with Spring, No. 807,
1 Paragon Scale, 6 in., div. 10, 40, 30 and 50 parts to the inch, 4 bevels, No. 1419 P. . . . . each $ 8 60

The pouch also contains compartments for a pencil and a fountain pen. These are not covered by the cover flap, to have the pencil and pen conveniently accessible without opening the flap.

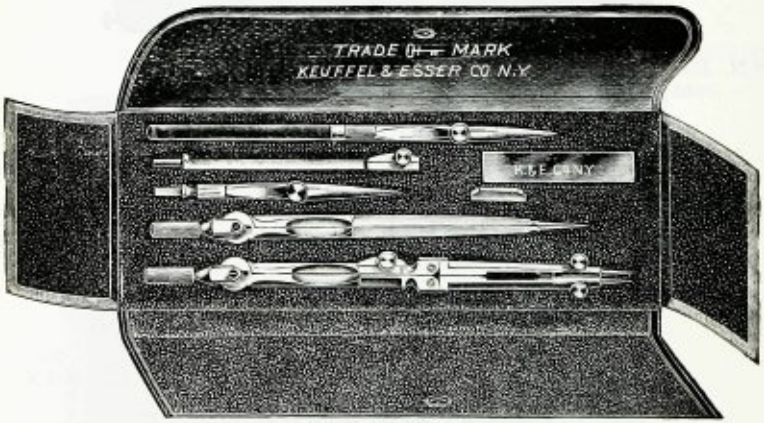
Each instrument stamped with trade-mark



No. 890 N.

890 N. Bar-lock Pocket Case,
cont'g: 1 Compass 5½ in., with fixed Needle Point, Pen, Pencil Point, and Lengthening Bar, No. 838,
1 Drawing Pen, 5½ in., Ebony Handle, upper blade with Spring, No. 808,
1 Box with Leads, No. 830, ... each $ 6 65

890 NP. Pocket Case with **folding flaps**, containing same assortment as No. 890 N. . . . . " 6 80



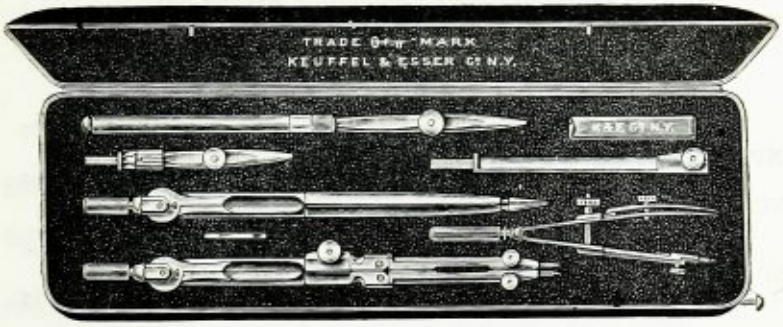
No. 892 N P.

892 N. Bar-lock Pocket Case,
cont'g: 1 Compass 5½ in., with fixed Needle Point, Pen, Pencil Point, and Lengthening Bar, No. 838,
1 Divider, 5½ in., No. 836,
1 Drawing Pen, 5½ in., Ebony Handle, upper blade with Spring, No. 808,
1 Box with Leads, No. 830, ... each $ 8 25

892 NP. Pocket Case with **folding flaps**, containing same assortment as No. 892 N. . . . . " 8 40

For empty cases for instruments, see page 140.

Each instrument stamped with trade-mark



No. 894N.

894N. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Divider, 5½ in., No. 836,
1 Steelspring Bow Pen, No. 751,
1 Drawing Pen, 5½ in., Ebony Handle, upper blade with Spring, No. 808,
1 Box with Leads, No. 830 . . . . . each $ 10 00

894 NP. Pocket Case with **folding flaps**, containing same assortment as No. 894N . . . . . " 10 15

894NC. Bar-lock Pocket Case, containing same assortment as No. 894N but Bow Pen No. 741 with central thumbnut, in place of No. 751 . . . . . " 10 65

894NCP. Pocket Case with **folding flaps**, containing same assortment as No. 894 NC . . . . . " ~~10 90~~ 10 80

For empty cases for Instruments, see page 140.

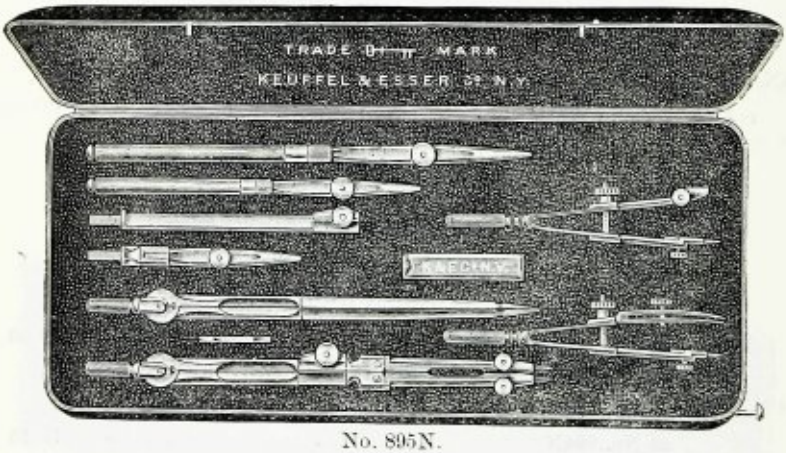
Each instrument stamped with trade-mark

894½N. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Divider, 5½ in., No. 836,
1 each Steelspring Bow Pen and Pencil, No. 751, 752,
1 Drawing Pen, 5½ in., Ebony Handle, upper blade with Spring, No. 808,
1 Box with Leads, No. 830 . . . . . each $ 11 75

894½NP. Pocket Case with **folding flaps**, containing same assortment as No. 894½N, ... " 11 95

894½NC. Bar-lock Pocket Case, containing same assortment as No. 894½N, but Bow Pen and Pencil No. 741, 742 with central thumbnut, in place of No. 751, 752 . . " 13 05

894½NCP. Pocket Case with **folding flaps**, containing same assortment as No. 894½NC. . . . . " 13 25



No. 895N.

895N. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Divider, 5½ in., No. 836,
1 each Steelspring Bow Pen and Pencil, No. 751,752,
1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806, 4½ in., and 808, 5½ in.,
1 Box with Leads, No. 830 . . . . . each $ 12 50

895NP. Pocket Case with **folding flaps**, containing same assortment as No. 895N, ... " 12 70

895NC. Bar-lock Pocket Case, containing same assortment as No. 895N, but Bow Pen and Pencil No. 741, 742, with central thumbnut, in place of No. 751, 752 . . . . " 13 80

895NCP. Pocket Case with **folding flaps**, containing same assortment as No. 895NC, ... " 14 00

For empty cases for instruments, see page 140.

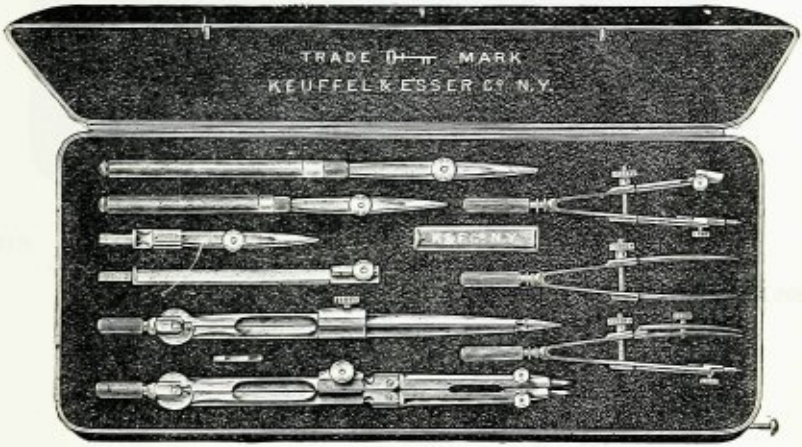
Each instrument stamped with trade-mark

895½N. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Hairspring Divider, No. 837,
1 each Steelspring Divider and Bows, No. 750, 751, 752,
1 Drawing Pen, 5½ in., Ebony Handle, upper blade with Spring, No. 808.
1 Box with Leads, No. 830 . . . . . each $13 65

895½NP. Pocket Case with **folding flaps**, containing same assortment as No. 895½N . . . . . " 13 90

895½NC. Bar-lock Pocket Case, containing same assortment as No. 895½N, but Bows No. 740, 741, 742 with central thumbnut, in place of No. 750, 751, 752 . . " 15 70

895½NCP. Pocket Case with **folding flaps**, containing same assortment as No. 895½NC, but Bows No. 740, 741, 742, with central thumbnut, in place of No. 750, 751, 752 . . . . . " 15 95



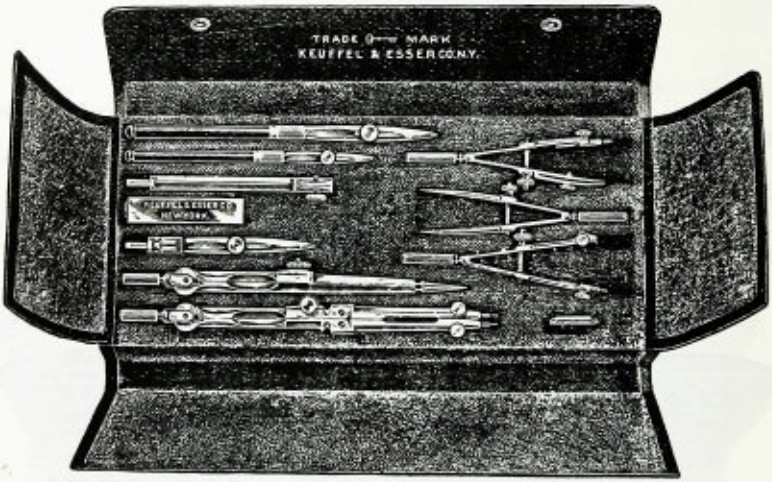
No. 896N.

896 N. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Hairspring Divider, No. 837,
1 each Steelspring Divider and Bows, No. 750, 751, 752,
1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806 4½ in., and 808, 5½ in.,
1 Box with Leads, No. 830 . . . . . each $14 50

896 NC. Bar-lock Pocket Case, containing same assortment as No. 896 N., but Bows No. 740, 741, 742 with central thumbnut, in place of No. 750, 751, 752 . . " 16 55

For empty cases for instruments see page 140.

Each instrument stamped with trade-mark



No. 896 NP.

896 NP. Pocket Case with **folding flaps,**

cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,

1 Hairspring Divider, No. 837,

1 each Steelspring Divider and Bows, No. 750, 751, 752,

1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806, 4½ in., and 808, 5½ in.,

1 Box with Leads, No. 830 . . . . . each ~~$ 10 00~~ 14 75

896NCP. Pocket Case with **folding flaps,** containing same assortment as No. 896 NP., but Bows No. 740, 741, 742 with central thumbnut, in place of No. 750, 751, 752 . . " 16 80

. . For empty cases for instruments see page 140.

Each instrument stamped with trade-mark



No. 897N.

897N. Bar-lock Pocket Case,
cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Hairspring Divider, 5½ in., No. 837,
1 Compass, 3½ in., with fixed Needle Point and Pen Point, No. 835,
1 Compass, 3½ in., with fixed Needle Point and Pencil Point, No. 835-1,
1 Steel Spring Divider, 3½ in., No. 750,
1 " " Bow Pen with Needle Point, 3½ in., No. 751,
1 Steel Spring Bow Pencil, with Needle Point, 3½ in., No. 752,
1 Drawing Pen with Joint, Aluminum Handle, 4½ in., No. 782,
1 Drawing Pen with Joint and Pin, Aluminum Handle, 6 in., No. 785,
1 Hatching Pen 5 in., White Handle, with 3 Pens to one Handle, No. 786,
1 Box with Leads, No. 836. . . . . each $22 50

897NP. Pocket Case with **folding flaps**, containing same assortment as No. 897N . . . . . " 22 80

897NC. Bar-lock Pocket Case, containing same assortment as No. 897N, but Bows No. 740, 741, 742 with central thumbnut, in place of Nos. 750, 751, 752 . . . . . " 24 55

897NCP. Pocket Case with **folding flaps**, containing same assortment as No. 897 NC. . . . . " 24 85

For empty cases for instruments see page 140.

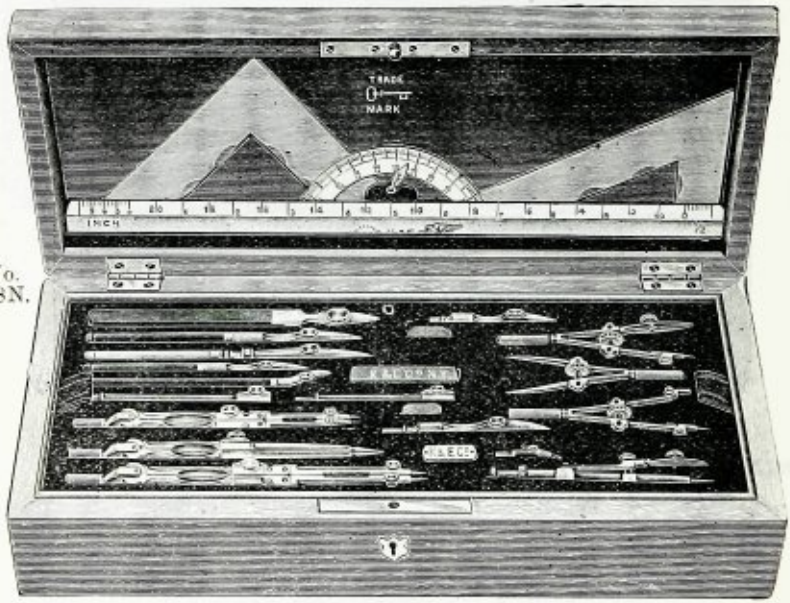
Each instrument stamped with trade-mark

EXTRA FINE
GERMAN INSTRUMENTS
WITH PIVOT JOINT.

BEST GERMAN SILVER, FINE STEEL POINTS, HIGHLY FINISHED.

"TRADE MARK"

IN POLISHED MAHOGANY CASES, VELVET LINED, WITH CUSHION BETWEEN INSTRUMENTS AND LID; LOCK AND TRAY.

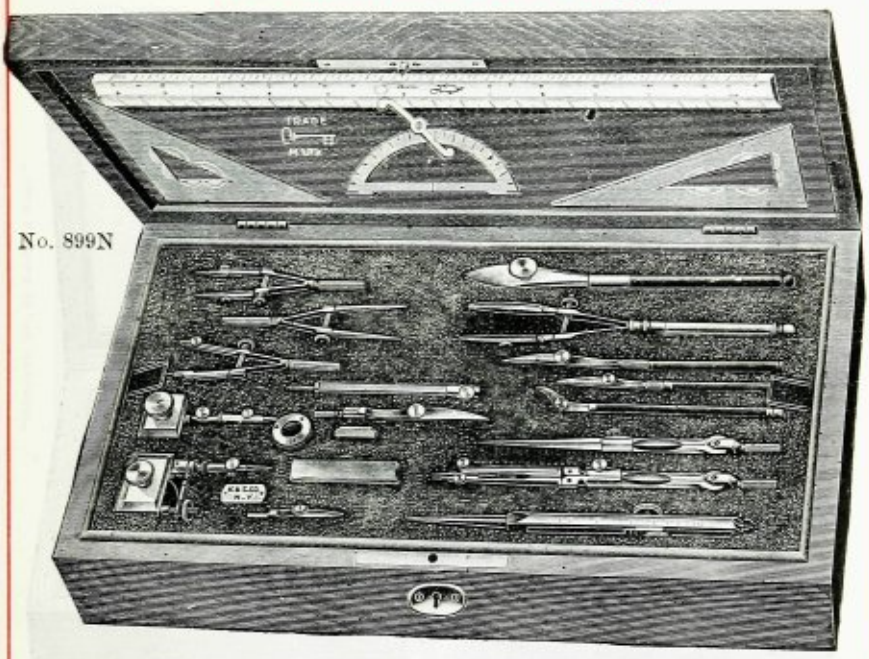


No. 898N.

898N. Polished Mahogany Case, Tray lined with Velvet, with Lock, cont'g: 1 Compass, 5½ in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838,
1 Hairspring Divider, 5½ in., No. 837,
1 Compass, 4½ in., with fixed Needle Point, Pen, Pencil Point, and Lengthening Bar, No. 838½,
1 each Steelspring Divider and Bows, 3½ in., with central thumbnut, No. 740, 741, 742,
1 Drop Spring Bow Pen and Pencil, 4 in., upper blade of Pen with Spring, No. 764,
1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806, 4½ in., 808, 5½ in.,
1 Drawing Pen, 5½ in., with German Silver Blades, with Joint, Aluminum Handle, No. 798,
1 Improved Curve Pen, 4¾ in , No. 696,
1 Detail Pen, 6½ in., flat Ebony Handle, No. 813,
1 Box with Leads, No. 830,
1 German Silver Protractor, 4½ in., No. 1260 N,
1 Boxwood Scale, 12 in., No. 1391,
1 each Xylonite Triangle, No. 1855, 8 in., 1856, 6 in. each $ 35 75

For empty cases for instruments, see page 140.

Each instrument stamped with trade-mark



No. 899N

899N. Polished Mahogany Case, Tray lined with Velvet, with Lock, cont'g: 1 Compass, 5½ in , with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838.
1 Hairspring Divider, 5½ in., No. 837,
1 each Steelspring Divider and Bows, No. 750, 751, 752.
1 Proportional Divider, 7 in., No. 729,
1 Beam Compass with Pen, Pencil, fixed Needle Point, Micrometer Adjustment, No. 772,
1 each Drawing Pens, Ebony Handle, upper blade with Spring, Nos. 806, 4½ in., 808, 5½ in.,
1 Detail Pen, 6¼ in , round Ebony Handle, No. 814.
1 Railroad Pen, both pens with joint, No. 805.
1 Improved Curve Pen, No. 696,
1 Horn Centre with German silver Rim, No. 2691,
1 Box with Leads, No. 830,
1 each Xylonite Triangle, No. 1855, 7 in., 1856, 6 in.
1 German silver Protractor, 4¼ in., No. 1260 N,
1 Boxwood Scale, 12 in., No. 1391 . . . . . each $ 39 75

899NC. Polished Mahogany Case, Tray lined with Velvet, with Lock, containing same assortment as No. 899N, but Bows No. 740, 741, 742 with central thumbnut, in place of No. 750, 751, 752 . . . . . each $ 41 80

For empty cases for instruments see page 140.

Each instrument stamped with trade-mark



No. 900N.

900 N. Polished Mahogany Case, Tray lined with Velvet, with Lock, cont'g: 1 Compass, 5½ in., with Hairspring to fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 838 H,
1 Hairspring Divider, No. 837,
1 Compass, 3½ in., with fixed Needle Point and Pen Point, No. 835,
1 Compass, 3½ in., with fixed Needle Point and Pencil Point, No. 835-1,
1 each Steelspring Divider and Bows, 3½ in., with central thumbnut Nos. 740, 741, 742,
1 Drop Spring Bow Pen and Pencil, 4 in., No. 764,
1 Beam Compass with Pen, Pencil, fixed Needle Point, Micrometer Adjustment, No. 772, with Wheel Attachment, No. 772½,
1 Proportional Divider, 7½ in., with Rack Movement, No. 732,
1 each Drawing Pen, Ebony Handle, upper blade with Spring, No. 806, 4½ in., No. 808, 5½ in.,
1 Drawing Pen, German Silver Blades, with Joint, Aluminum Handle, No. 798, 5½ in.,
1 Detail Pen, flat Ebony Handle, 6½ in., No. 813,
1 Detail Pen for double lines, Ebony Handle, 6½ in., No. 815,
1 Railroad Pen, both pens with joint, No. 805,
1 Improved Curve Pen, No. 696,
1 Box with Leads, No. 830,
1 each Xylonite Triangle, No. 1855-8 in., No. 1856-6 in.,
1 German silver Protractor, 6⅝ in., No. 1262N,
1 Paragon Scale, 12 in., No. 1391 P. . . . . $ 66 50

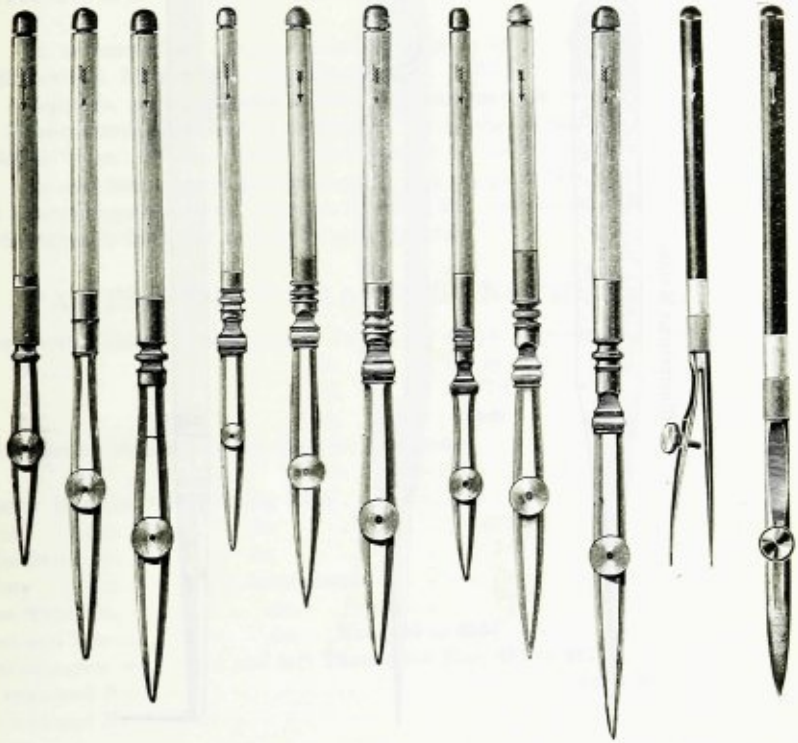
For empty cases for instruments see page 140.

Each instrument stamped with trade-mark

FINE GERMAN DRAWING PENS.

"TRADE MARK."

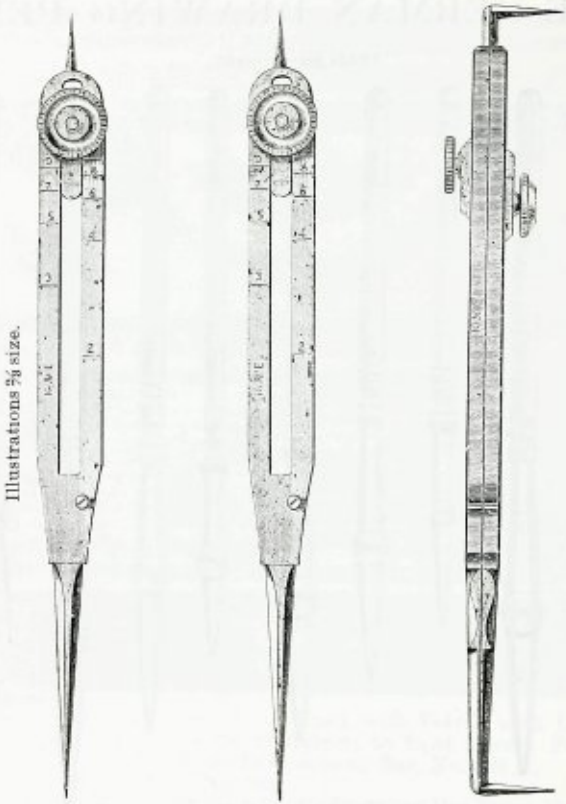
"Copyright, 1887, by Keuffel & Esser."



No.	919.	920.	921.	922.	922½.	923.	924.	924½.	925.	928.	929.

919.	Drawing Pen, White Handle,	4½ in.		each $	30
920.	do.	"	5¼ "	"	35
921.	Drawing Pen,	"	5½ " plain Joint	"	40
922.	Drawing Pen,	"	4½ " fine Joint	"	45
922½.	do.	"	5 " " "	"	50
923.	do.	"	5½ " " "	"	55
924.	Drawing Pen,	"	4½ " fine Joint and Pin	"	65
924½.	do.	"	5½ " " " "	"	70
925.	do.	"	6 " " " "	"	75
928.	Drawing Pen, Ebony Handle,	4½ in.	upper blade with Spring	"	60
929.	do.	"	5½ " " " "	"	65

For Brand Drawing Pens see page 118.



Illustrations ⅔ size.

No. 1085. 1087. 1091

1085. Brass Proportional Dividers, $6\frac{1}{4}$ in., divided for Lines, in Case . . . . . each $ 2 00

1087. German Silver Proportional Dividers, $6\frac{1}{4}$ in., divided for Lines, in Case . . . . . " 2 50

1091. German Silver Proportional Dividers, 7 in., divided for Lines, with Rack-Movement, Points bent rectangular, in Case . . . . . " 7 00

For other Proportional Dividers see pages 58, 111.

SEPARATE PARTS

FOR

PARAGON & "KEY" BRAND INSTRUMENTS.

To accommodate our customers we keep in stock separate parts for our Mathematical Instruments, as listed below. While we can replace parts for compasses, **we can replace neither the compasses (to be fitted to parts), nor the three-cornered steel legs of compasses.** To repair points which are not detachable from the compasses (fixed points) is generally not advisable.

As our instruments are hand-made and the parts belonging to them are not interchangeable, they must be fitted to the instrument. The charge for such fitting is included in the following prices:

PARTS FOR PARAGON INSTRUMENTS.

Pen Points,	Pencil Points,	Needle Points,	for 3½ in.	Compasses	each	$	1 25
do.	do.	do.	" 4½, 5½, 6 in.	"	"		1 35
do.	do.	do.	" 6½, 7 in.	"	"		1 55
do.	do.	do.	" Beam	"	"		1 00
Lengthening Bars for 3½, 4½, 5½, 6 in. Compasses					"		1 25
do.	" 6½, 7	"	"		"		1 50
Ebony Handles for Drawing Pens					"		15
Ivory do.	" do.				"		20
Aluminum do.	" do.				"		25
Ivory do.	" Bow Instruments				"		20
Ger. Silver do.	" do.				"		25
Nut and Thread	" do.	Nos. 460 to 482½			"		30
Thumbscrew with right and left Thread for Nos. 485 to 487					"		40
Screws and Nuts					each	$	12 to 15
Shouldered Needles					"		12 " 15

PARTS FOR "KEY" BRAND INSTRUMENTS.

Pen Points,	Pencil Points,	Needle Points,	for 3½ in.	Compasses	each	$	80
do.	do.	do.	" 4½, 5½ in.	"	"		1 00
do.	do.	do.	" Beam	"	"		80
Ebony Handles for Drawing Pens					"		10
Aluminum do.	" do.				"		15
White do.	" Bow Instruments				"		15
Ger. silver do.	" do.				"		15
Nut and Thread	" do.	Nos. 750 to 757			"		20
Thumbscrew with right and left Thread for Bows, Nos. 740-742					"		30
Screws and Nuts					each	$	08 to 10
Shouldered Needles					each	$	06

Drilled Needle Points, for Drawing Ellipses by means of a thread, per pair **25**

We have the best facilities for Repairing and Cleaning Drawing Instruments and Sharpening Ruling Pens.

CASES FOR DRAWING INSTRUMENTS

We furnish well made velvet lined cases for drawing instruments and here list some of the usual sizes.

When ordering a case separate from the instruments, it is well to send on the instruments to insure their proper fitting in the tray.

The price of the case includes the fitting of the instruments.

WOODEN CASES WITH LOCK AND TRAY

These Cases are made of thoroughly seasoned wood, have a tray to hold the instruments, and under the tray room for colors, brushes, etc.

Partitions under the tray for tools, colors, etc., can be added at slight additional cost.

The dimensions refer to the size of the tray in the box.

Size of Tray.	Mahogany, Brass Hinges and Shield, Tray lined with Velvet.	Mahogany polished, German Silver Shield, Hinges and Lock plated, Tray lined with Silk Velvet.
4 × 9 in.	each $ 3 75	each $ 5 00
5 × 9 "	" 4 50	" 5 75
5 × 12½ "	" 5 75	" 7 50
6 × 10 "	" 5 50	" 7 50
7 × 11 "	" 6 50	" 8 75
7 × 13 "	" 7 00	" 10 00
10 × 14 "	" 9 00	" 14 00

Cases of mahogany, oak or other wood, with drawers, German silver or plated corners, bands, name-plate, escutcheon etc., made to order. Such cases are illustrated under Nos. 583 and 584, pages 78 and 80.

POCKET CASES

These Cases are covered with morocco, lined with Velvet and have a Bar Lock as illustrated under Nos. 560, 850, etc. or folding flaps with button lock, as illustrated under No. 624 P, 896 P etc.

Bar-lock case will be sent on orders unless folding-flap case is specified.

Size of Case.	Lined with Velvet.	Lined with Silk Velvet.
2 × 6 in.	each $ 1 30	each $ 1 50
3 × 7½ "	" 1 75	" 2 00
3½ × 9 "	" 2 00	" 2 50
5 × 9 "	" 2 40	" 3 00
6 × 10 "	" 3 50	" 4 50
7 × 11 "	" 4 25	" 5 00

For Pocket Cases with folding flaps, add 20% to above prices. For those with recessed and partitioned lid (see No. 624D. L. page 97), add 50%.

For other cases see opposite.

EXTRA-FINE POCKET CASES

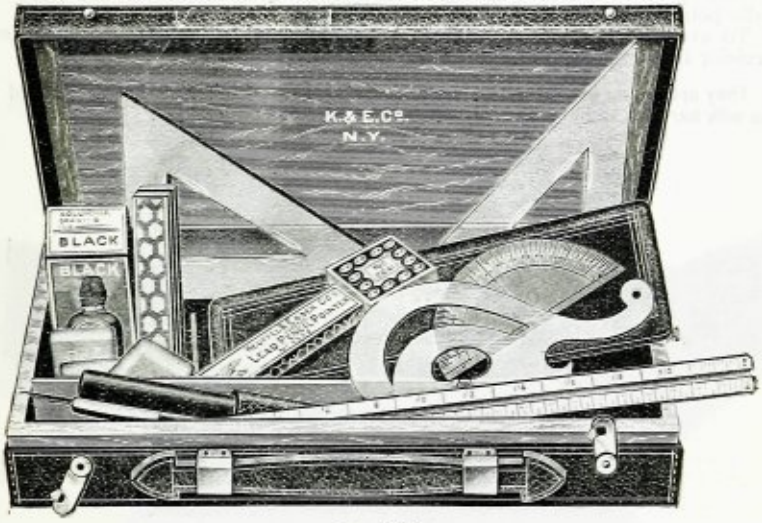
OF

FANCY LEATHER, WITH FOLDING FLAPS.

We furnish to order Pocket Cases with Folding Flaps (see illustration of No. 624 P, page 94), of finest workmanship, lined with silk velvet and covered with fancy leather, such as **Walrus, Genuine morocco, Pig skin, Alligator, Russia leather, Seal, Lizard** etc. Such cases are very appropriate for gifts. Prices on application.

CARRYING CASE FOR DRAWING TOOLS.

(Dress Suit Case Style.)



No. 990

990. Sewed Leather Carrying Case for Drawing Tools . . . . . each $ 5 00

Fine Sewed Sole Leather Case, natural color, $13\frac{1}{2} \times 7\frac{1}{2} \times 2\frac{1}{2}$ in., with grip handle and nickelplated safety hooks, lined with wood and partitioned for set of instruments, triangles, curves, scales, pencils, thumbtacks, rubbers, liquid ink, pencil pointer, etc. A neat, convenient and durable case for students and others who carry their drawing tools about.

EXCELSIOR INSTRUMENTS

GERMAN SILVER. FOR TECHNICAL SCHOOLS.

Compasses and Dividers with Handle.

TRADE- MARK.

EXCELSIOR

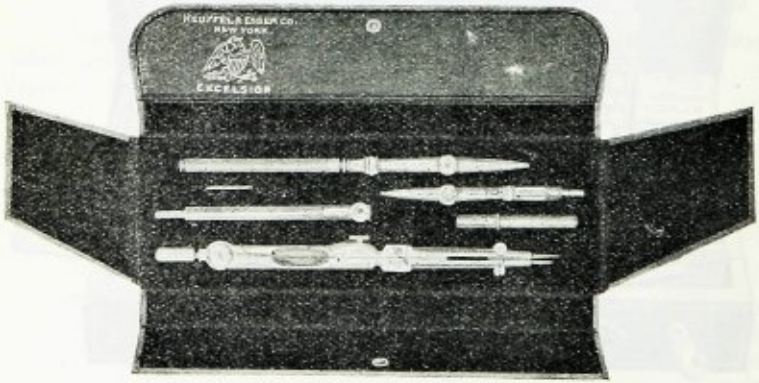
The Excelsior Instruments which we have been listing for many years in the Trade Supplement to our Catalogue, have become so popular that we have decided to list them in our General Catalogue in place of the Arrow Brand Instruments, of which we retain only the drawing pens, (page 137).

The Excelsior Instruments meet the demand for a good durable instrument with handle, at a moderate price, for use in those schools where drawing is of minor importance.

The combination of tongue joint with handle solves the problem of making satisfactory instruments of this grade. The compasses, their pen, pencil and needle points, and the dividers, have steel joints.

To avoid confusion, we retain the numbers under which we list these Excelsior Instuments in our Trade Supplement.

They are put up in neat velvet lined pocket cases. Each assortment is listed in case with bar lock and also in case with folding flaps and button lock.



No. 9020F.

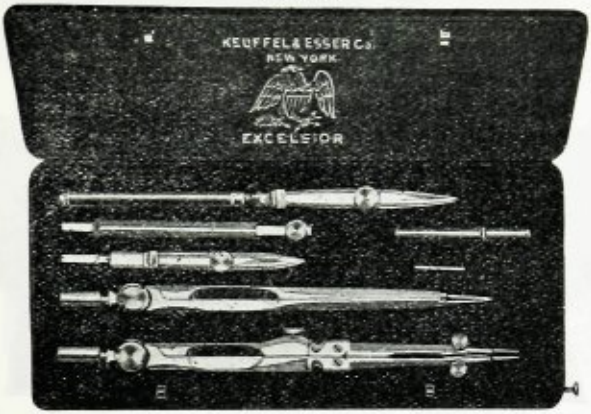
9020. Bar-lock Pocket Case,
cont'g: 1 Compass 6 in. with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, 2 Shouldered Needles, No. 9042,
1 Drawing Pen 5½ in. with joint, Ebony Handle, No. 9049,
1 Box with Leads. . . . . each $3 50

9020F. Pocket Case with **folding flaps**, containing same assortment as No. 9020 . . . . . " 3 80

For separate Excelsior Instruments see page 147.

TRADE- MARK.

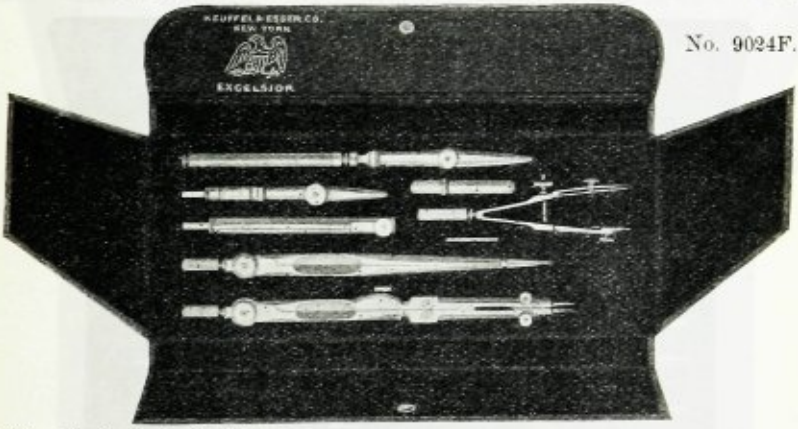
EXCELSIOR



No. 9022.

9022. Bar-lock Pocket Case,
cont'g: 1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 9042,
1 Dividers 6 in., No. 9040,
1 Drawing Pen, 5½ in., with joint, Ebony Handle, No. 9049,
1 Box with Leads . . . . . each $ 4 50

9022F. Pocket Case with **folding flaps**, containing same assortment as No. 9022 . . . . . " 4 80



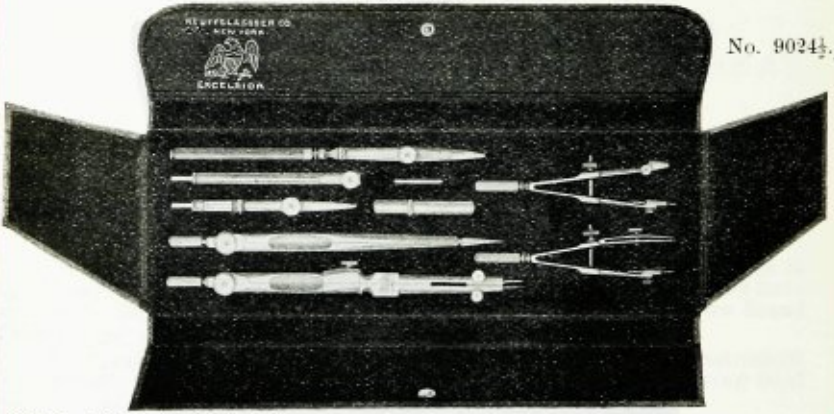
No. 9024F.

9024. Bar-lock Pocket Case,
cont'g: 1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 9042,
1 Dividers, 6 in., No. 9040,
1 Steel Spring, Bow Pen, 3½ in., with Needle Point, No. 9046,
1 Drawing Pen, 5½ in., with joint, Ebony Handle, No. 9049,
1 Box with Leads . . . . . each $ 5 80

9024F. Pocket Case with **folding flaps**, containing same assortment as No. 9024 . . . . . " 6 20

For separate Excelsior Instruments, see page 147.

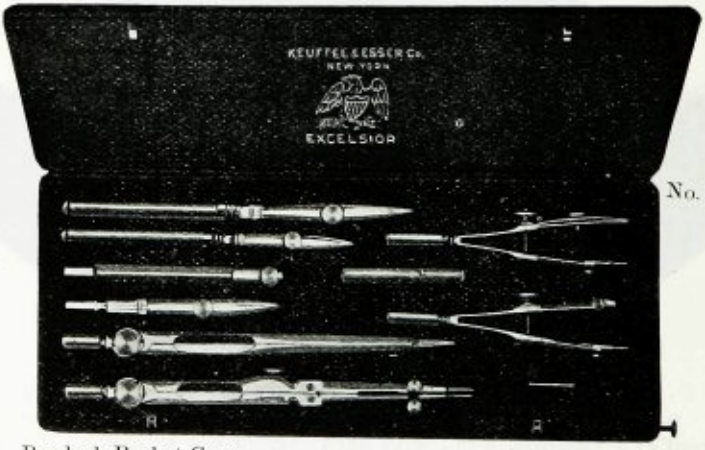
TRADE- MARK.
EXCELSIOR



No. 9024½ F.

9024½. Bar-lock Pocket Case,
cont'g: 1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 9042, 1 Dividers, 6 in., No. 9041,
1 each Steelspring Bow Pen and Pencil, 3½ in., with Needle Point, No. 9046, 9047,
1 Drawing Pen, 5½ in., with joint, Ebony Handle, No. 9049,
1 Box with Leads . . . . . each $ 7 00

9024½ F. Pocket Case with Folding Flaps, containing same assortment as No. 9024½ . . . . . each 7 50



No. 9025

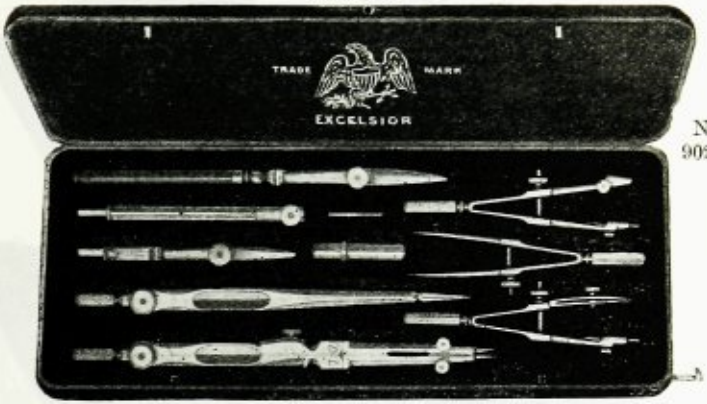
9025. Bar-lock Pocket Case,
cont'g: 1 Compass, 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 9042, 1 Dividers, 6 in., No. 9040,
1 each Steelspring Bow Pen and Pencil, 3½ in., with Needle Point, No. 9046, 9047,
1 each Drawing Pen, 4½ in., 5½ in., with joint, Ebony Handle, No. 9048, 9049, 1 Box with Leads . . . . . each $ 7 70

9025 F. Pocket Case with Folding Flaps, containing same assortment as No. 9025 . . . . . " 8 20

For separate Excelsior Instruments, see page 147.

TRADE- MARK.

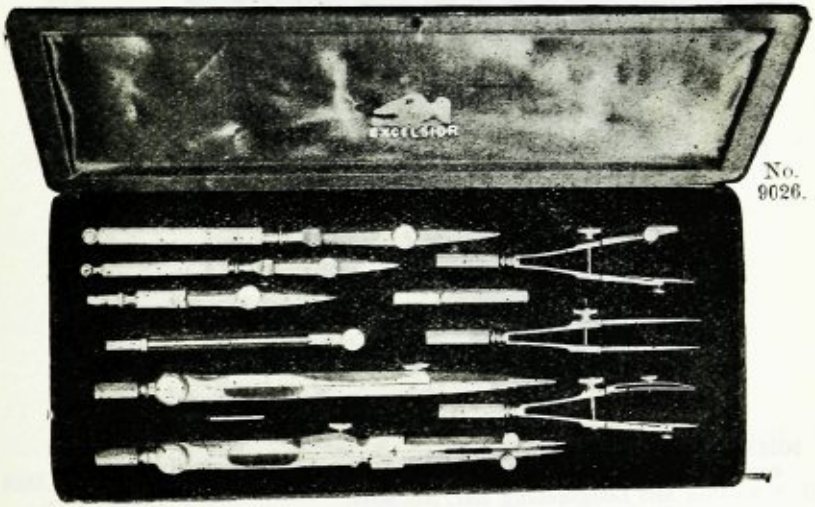
EXCELSIOR



No. 9025½.

9025½ Bar-lock Pocket Case,
cont'g: 1 Compass 6 in. with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 9042. 1 Divider 6 in. No. 9040.
1 Set Steel Spring Divider and Bows 3½ in., No. 9045, 9046, 9047,
1 Drawing Pen 5½ in. with joint, Ebony Handle No. 9049.
1 Box with Leads . . . . . each $8 10

9025½F. Pocket Case with **folding flaps,** containing same assortment as No. 9025½ . . . . . each 8 60

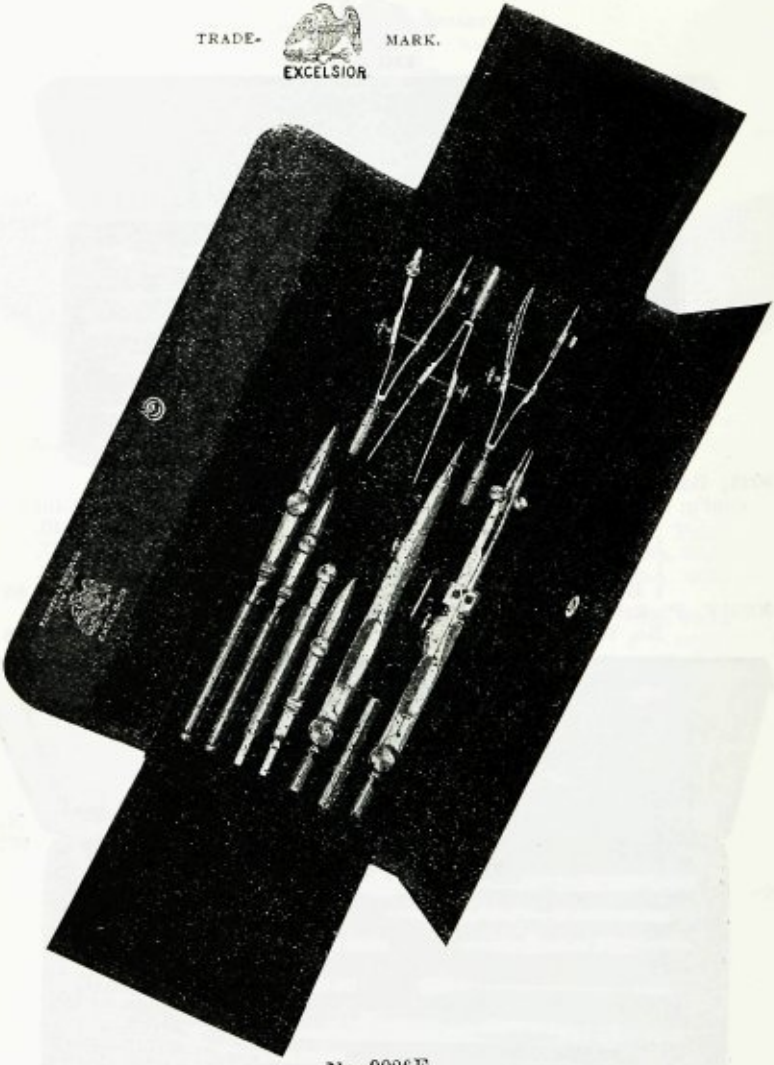


No. 9026.

9026 Bar-lock Pocket Case,
cont'g: 1 Compass 6 in. with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 9042. 1 Dividers 6 in. No. 9040.
1 Set Steel Spring Divider and Bows, 3½ in., No. 9045, 9046, 9047,
1 Drawing Pen 4½ in. with joint, Ebony Handle No. 9048.
1 Drawing Pen 5½ in. with joint, Ebony Handle No. 9049.
1 Box with Leads . . . . . each $9 40

For separate Excelsior Instruments see page 147.

TRADE- MARK.
EXCELSIOR



No. 9026F.

9026F. Pocket Case with **folding flaps**
cont'g: 1 Compass 6 in. with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, No. 9042.
1 Dividers 6 in. No. 9040.
1 Steel Spring Bow Dividers 3½ in. No. 9045.
1 Steel Spring Bow Pen 3½ in. with Needle Point No. 9046.
1 Steel Spring Bow Pencil 3½ in. with Needle Point No. 9047.
1 Drawing Pen 4½ in. with joint, Ebony Handle No. 9048.
1 Drawing Pen 5½ in. with joint, Ebony Handle No. 9049.
1 Box with Leads . . . . . each $10 00

For separate Excelsior Instruments see page 147.

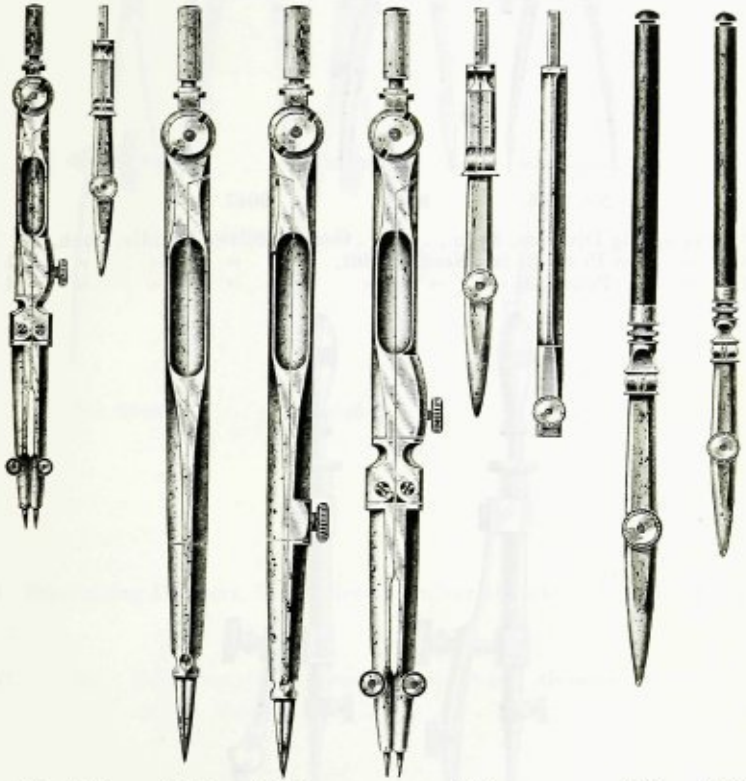
EXCELSIOR INSTRUMENTS

GERMAN SILVER.

(For description see page 142.)

TRADE- MARK

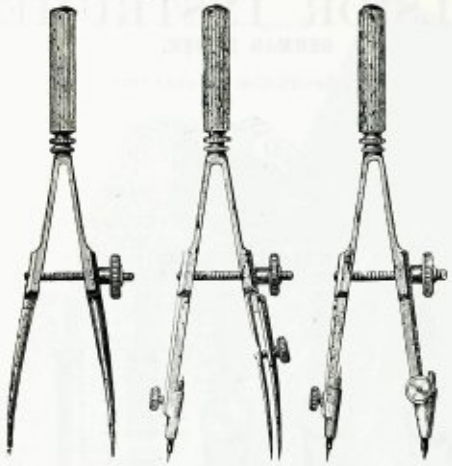
EXCELSIOR



No. 9035 9040 9041 9042 9048 9049

9035.	Compasses 3½ in., with fixed Needle Point, Pen and Pencil Point, 2 Shouldered Needles	each	$ 2 00
9040.	Dividers 6 in.	"	90
9041.	Hairspring Dividers 6 in.	"	1 50
9042.	Compasses 6 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar, 2 Shouldered Needles . .	"	2 30
9048.	Drawing Pen, 4½ in. with Joint, Ebony Handle	"	50
9049.	" " 5½ in. " " " "	"	55

These instruments are listed in Sets under Nos. 9020 to 9026 F, pages 142 to 146.



No. 9045. 9046. 9047.

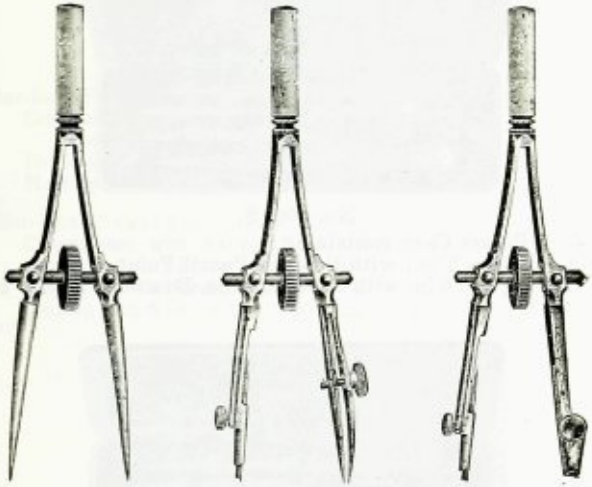
9045. Steelspring Dividers, 3½ in., ... German Silver Handle, each, $ 80
9046. " Bow Pen, 3½ in., Needle Point, " " " " 1 10
9047. " " Pencil, 3½ " " " " " " " 1 10



No. 9046D. 9047D.

9046D. Drop Spring Bow Pen, 3¾ in., for small circles, German Silver Handle . . . . . each $ 1 85
9047D. do. do. Pencil, 3¾ in., for small circles, German Silver Handle . . . . . " 1 85

In Spring Bows Nos. 9046D. and 9047D. a steel rod passes through the instrument, serving as needle point and carrying the handle. This center-rod remains stationary while the pen or pencil revolve around it and draw by their own weight.



No. 9045 C. 9046 C. 9047 C.

9045 C. Steelspring Dividers, 3½ in., German Silver Handle . . . each $ 1 25

9046 C. do. Bow Pen, 3½ in., with Needle Point, German Silver Handle . . . . . " 1 50

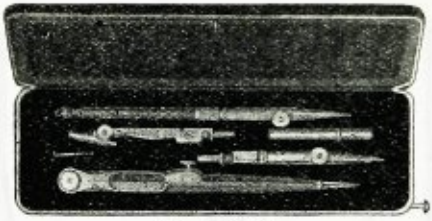
9047 C. do. Bow Pencil, 3½ in., with Needle Point, German Silver Handle . . . . . " 1 50

The bows No. 9045 C to 9047 C are opened and closed by a right and left thread, operated by one thumbscrew situated between the shanks of the instrument. The threads hold the shanks rigid and double the speed of the screw.

NICKELPLATED INSTRUMENTS

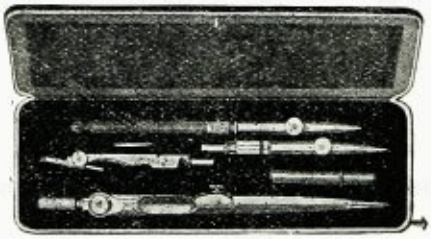
OF LOW PRICE, IN POCKET CASE WITH BAR LOCK.

FOR BEGINNERS.



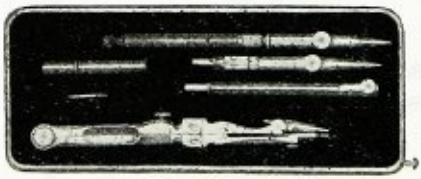
No. 1006 S.

1006 S. Bar-lock Pocket Case, containing:
Compasses 5 in., with Pen and Pencil Point,
Ruling Pen 5 in. with ebony handle, Box with Leads, each $1 15



No. 1006 H.

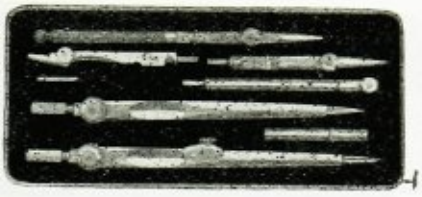
1006 H. Bar-lock Pocket Case, containing:
Compasses **with Handle**, 5 in., with Pen and Pencil Point,
Ruling Pen 5 in., with ebony handle, Box with Leads, " 1 25



No. 1007 S.

1007 S. Bar-lock Pocket Case, containing:
Compasses 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Ruling Pen 5 in. with ebony handle, Box with Leads, " 1 45

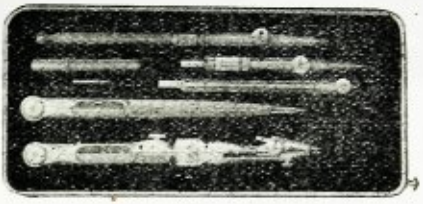
1007 H. Bar-lock Pocket Case, containing:
Compasses **with Handle**, 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Ruling Pen 5 in. with ebony handle, Box with Leads, " 1 55



No. 1008 H.

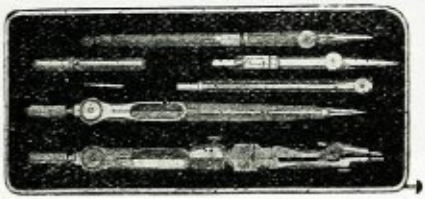
1008 S. Bar-lock Pocket Case, containing:
Compasses 5 in., with Pen, Pencil Point, and Lengthening Bar,
Dividers 5 in.,
Ruling Pen 5 in with ebony handle, Box with Leads, each $ 1 65

1008 H. Bar-lock Pocket Case, containing:
Compasses **with Handle** 5 in., with Pen, Pencil Point and Lengthening Bar,
Dividers **with Handle** 5 in.,
Ruling Pen 5 in. with ebony handle, Box with Leads, " 1 85



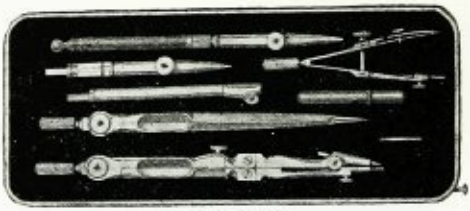
No. 1009 S.

1009 S. Bar-lock Pocket Case, containing:
Compasses 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Dividers 5 in.,
Ruling Pen 5 in. with ebony handle, Box with Leads, " 1 75



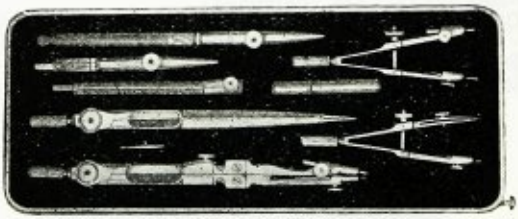
No. 1009 H.

1009 H. Bar-lock Pocket Case, containing:
Compasses **with Handle** 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Dividers **with Handle** 5 in.,
Ruling Pen 5 in. with ebony handle, Box with Leads, " 1 95



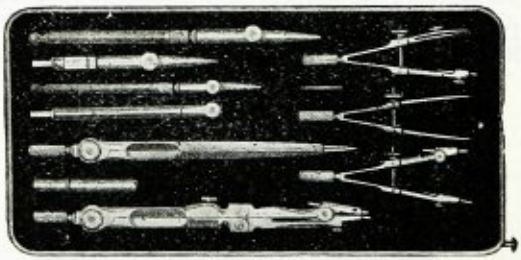
No. 1010 H.

1010 H. Bar-lock Pocket Case, containing:
Compasses **with Handle,** 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Dividers **with Handle** 5 in.,
Spring Bow Pen 3½ in., with Needle point,
Ruling Pen 5 in. with ebony handle, Box with Leads, each $ 3 00



No. 1011 H.

1011 H. Bar-lock Pocket Case, containing:
Compasses **with Handle,** 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Dividers **with Handle,** 5 in.,
Spring Bow Pen 3½ in., with Needle point,
Spring Bow Pencil 3½ in., with Needle point,
Ruling Pen 5 in. with ebony handle, Box with Leads, " 3 60



No. 1012 H.

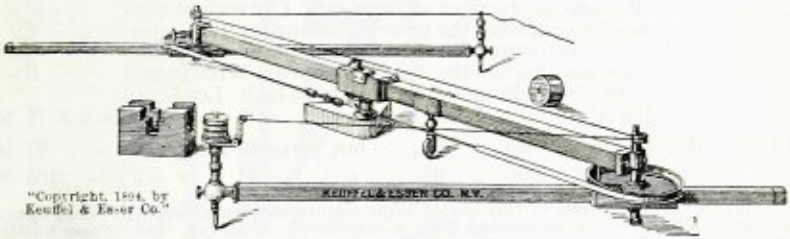
1012 H. Bar-lock Pocket Case, containing:
Compasses **with Handle,** 5 in., with fixed Needle Point, Pen, Pencil Point and Lengthening Bar,
Dividers **with Handle,** 5 in.,
Steel Spring Bow Dividers 3½ in.,
Spring Bow Pen 3½ in., with Needle point,
Spring Bow Pencil 3½ in., with Needle point,
Ruling Pen 4 in., with ebony handle,
Ruling Pen 5 in. with ebony handle, Box with Leads, " 4 25

EIDOGRAPHS AND PANTOGRAPHS

are instrument designed to reproduce drawings on a reduced, equal or enlarged scale. It is obvious, that in order to obtain a correct reproduction, instruments of extreme accuracy must be employed, especially in enlarging, as in this case any error arising from imperfect mechanical construction is magnified.

EIDOGRAPHS.

For reproducing to even scale, enlarging up to 1:8 and reducing up to 8:1.



No. 1120.

1120. Eidograph, brass, of improved construction, Arms 30 in., with 2 Balance-weights and movable Support, complete, in Hardwood Case, with Table of Settings . . . . . each $110 00

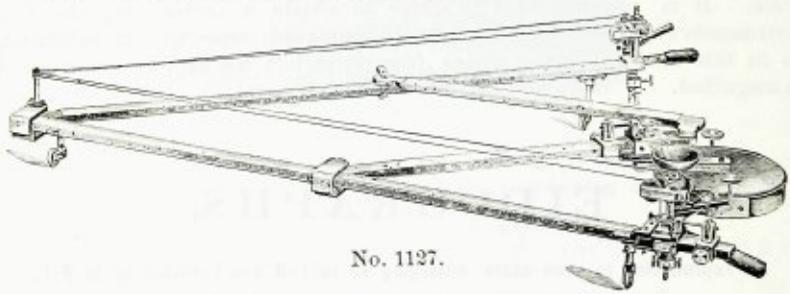
1121. Eidograph, like No. 1120, but Arms 36 in. . . . . " 125 00

These **Eidographs** are very carefully constructed instruments; their motions are delicate and regular and they cover a larger surface than a pantograph of similar size. The main beam, as shown in the cut, revolves horizontally upon a heavy socket. At each end of this beam is a disc and the two are connected by an encircling steel band, so that either disc transmits simultaneous motion to the other. The steel band is adjustable to secure equal motion of both discs. To the under surface of each disc a sleeve is attached, through which passes an adjustable arm. Each arm carries either tracing or pencil point. The main beam and the arms are graduated and provided with verniers. Very fine settings can be obtained, and ratios can be established with great accuracy according to the formula furnished with each instrument. Allowance can be made for the shrinkage of originals, and drawings can be so reproduced that the **area** of the original and of the copy bear any desired ratio to each other.

PANTOGRAPHS

with Wheel Supports.

For Reducing from 6 : 1 to 1 : 1 or Enlarging from 1 : 1 to 1 : 6 in all ratios.



No. 1127.

1126. Pantograph of hollow, square brass bars, 24 in., connected by pivot joints. The left-hand bar is graduated and has a vernier and micrometer adjustment. Convenient contrivance for operating the pencil from the tracing point. Solid iron fulcrum with two adjustable needle points to fix its position on the drawing board. With Pencil Point, two Steel Points, one box of 5-inch Leads, in wooden Case with Lock and key . . . . . each $ 71 50

1127. do. do. do. do. but bars 28 in. . . . " 87 50

1128. do. do. do. do. " 33 " . . . " 100 00

Pantographs Nos. 1126 to 1128 are of high quality and workmanship. They move on casters and are not suspended from a standard. Although this causes a little more friction, it makes the instrument better adapted for use in a limited space. It can also be stored in its case more readily than the suspended pantographs, as it does not require setting up like the latter. These pantographs are adapted especially for reducing, but they can be used for enlarging.

SUSPENDED PANTOGRAPHS

Suspended Pantographs, (Nos. 1122 to 1134,) are very delicate instruments. There is no friction of the supports of the bars on the drawing, as the entire mechanism is suspended.

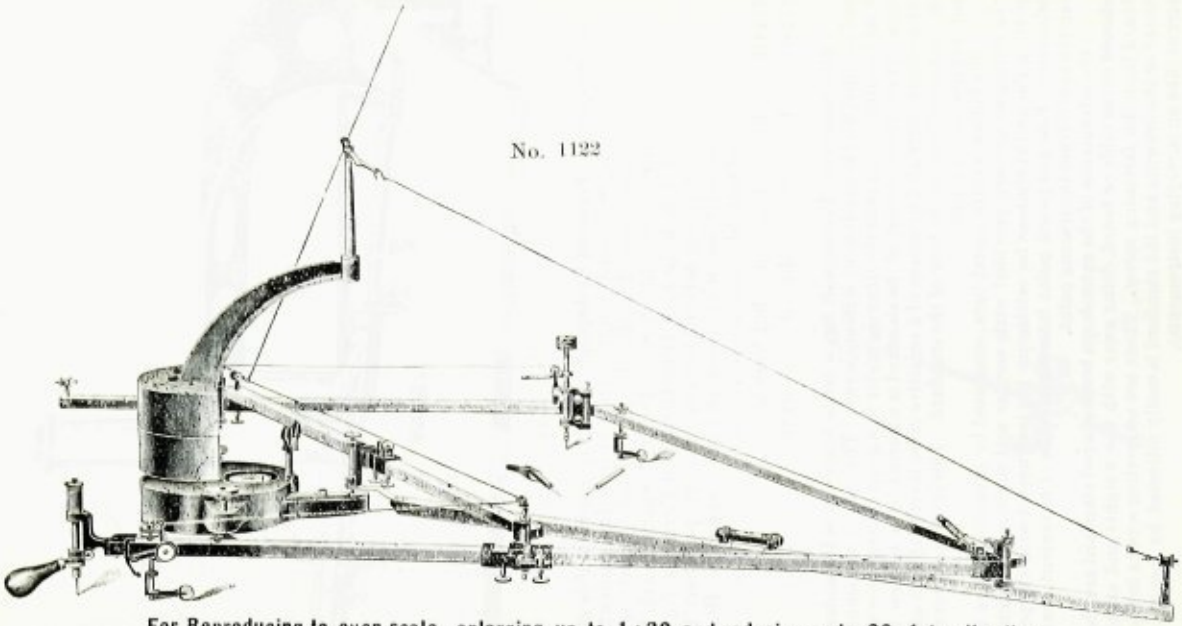
Of the **Suspended Pantographs** only **Nos. 1122 to 1124** will reproduce in all ratios from the size of the original to 1 : 20 or 20 : 1, as only these pantographs have the arrangement for placing the pole within the parallelogram (interchanging the pole for one of the tracing points). Other suspended pantographs do not have this arrangement and reproduce only within the limits stated with the description.

Precision Pantographs Nos. 1122 to 1125½, are, on account of their fine mechanical construction, especially adapted for very accurate reproductions, and are highly recommended to Civil and Mechanical Engineers, Topographers, Hydrographers, Engravers and Lithographers.

Suspended Pantographs Nos. 1129 to 1131, resemble Nos. 1125 and 1125½ but are of simpler construction, although of the same class of workmanship and material. These instruments are recommended to Designers, Pattern Makers, etc., for drawings where the highest degree of accuracy is not required.

Suspended Pantographs Nos. 1132 to 1134 do not have their bars graduated throughout and are therefore limited to the ratios for which they are marked, as stated in their description. Within their range they are good reliable instruments.

PRECISION PANTOGRAPHS.



No. 1122

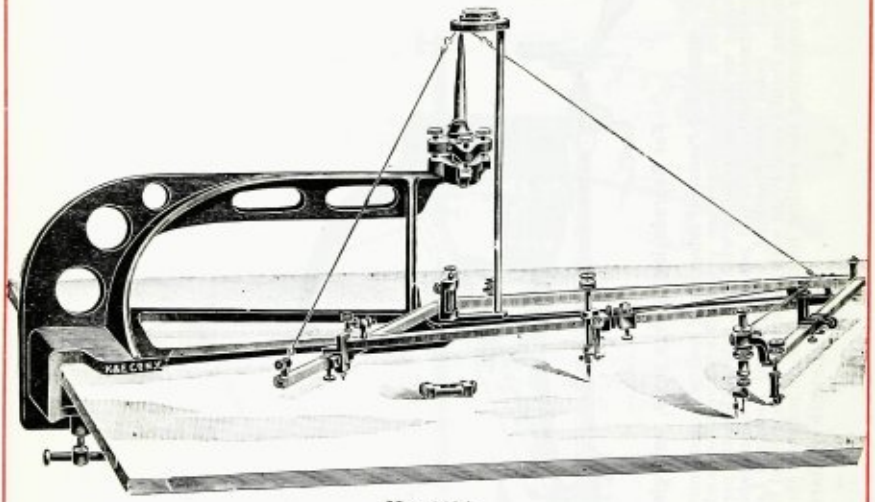
For Reproducing to even scale, enlarging up to 1 : 20 and reducing up to 20 : 1 in all ratios.

Suspended **Precision Pantograph** of hollow, square metal bars, connected by pivot-joints; the bars are graduated throughout and the sliding sockets are provided with verniers and micrometer adjustments. Extra Supporting Bar and appliances for setting up the instrument with the pole within the parallelogram, in which position it will reproduce the size of the original, (see illustration). Pole and pencil point interchangeable. Convenient contrivance for operating the pencil from the tracing point. Solid iron Standard, with 2 Spirit Levels, 2 Leveling Screws, and 2 extra Weights. Instrument with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 Spirit Level, 1 Box of 5-inch Leads, Directions and Formula for computing the setting for any ratio, in polished Hardwood Case with Lock and key,

1122.	Length of Bars, 33 inches . . . . each	$160 00
1123.	" " " 38 " . . . . "	170 00

PRECISION PANTOGRAPHS.

For Reproducing to even scale, enlarging up to 1 : 20 and reducing up to 20 : 1 in all ratios.



No. 1124.

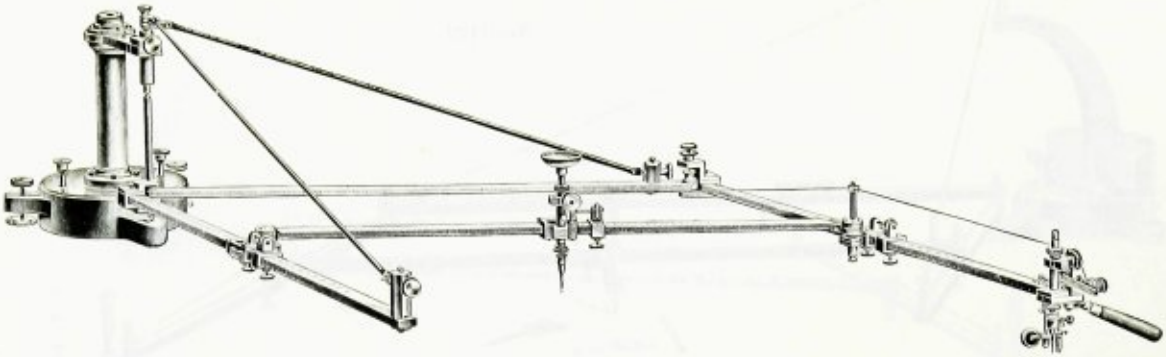
1124.	Suspended **Precision Pantograph,** extra large adjustable clamping Standard, length of bar 24 in. Instrument with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 Spirit Level, 1 Box of 5-inch Leads, Directions and Formula for computing the setting for any ratio, in polished Hardwood Case with Lock and key, separate Box for Standard			each	$ 180 00
1124B.	do.	do.	do. but bars 33 in.	"	200 00
1124C.	do.	do.	do. " " 38 in.	"	210 00

This suspended Pantograph has a large brace-shaped standard of great stability and rigidity, held in position by a clamp screw. The base of the standard is raised off the board to admit of slipping the drawing under it, a great convenience when reducing drawings. The vertical support of the standard is adjusted by a 4-screw leveling head and its adjustment controlled by means of a sensitive cross level with fork-shaped support, resting on the ball pole of the base of the standard. This level is removed after the vertical support has been adjusted.

The hollow, square metal bars, connected by pivot-joints, are fully graduated, and the sliding sockets are provided with vernier and micrometer adjustment. Extra Supporting Bar and appliances for setting up the instrument with the pole within the parallelogram. Pole and pencil point interchangeable. Convenient contrivance for operating the pencil from the tracing point.

The advantages of the extra-large brace-shaped standard are that the instrument is clamped to the table or board, doing away with the weights and avoiding damage to the board from the fastening screw. There are no leveling screws in the base to injure the board or the drawing and the standard is easily adjusted by means of the four leveling screws (like on surveying instruments).

PRECISION PANTOGRAPHS.



No. 1125.

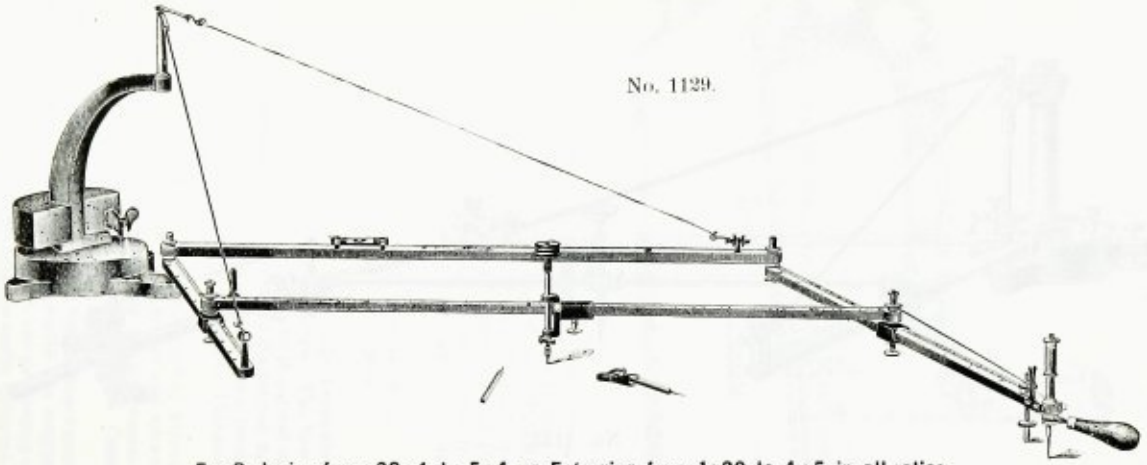
No. 1125. For Reducing from 15 : 1 to 5 : 4 or Enlarging from 1 : 15 to 4 : 5 in all ratios.
No. 1125½. " " " 20 : 1 to 5 : 4 " " " 1 : 20 to 4 : 5 " " "

These Suspended **Precision Pantographs** are of finest quality and very similar in construction to No. 1122 and 1123. The brass Standard, on heavy iron base with adjusting screws, carries a sensitive circular level. The square hollow brass bars are connected by pivot joints and sliding sockets, which carry verniers and have micrometer adjustment. They are graduated to half-millimeters and read by vernier to $\frac{1}{20}$ millimeter. Instrument complete with 1 Box of 5-inch Leads. Directions and Formula for computing the setting for any ratio, in wooden Box with Lock and key.

1125. Length of Bars, 24 inches . . . . each $ 155 00
1125½. " " " 33 " . . . . " 165 00

SUSPENDED PANTOGRAPHS.

No. 1129.



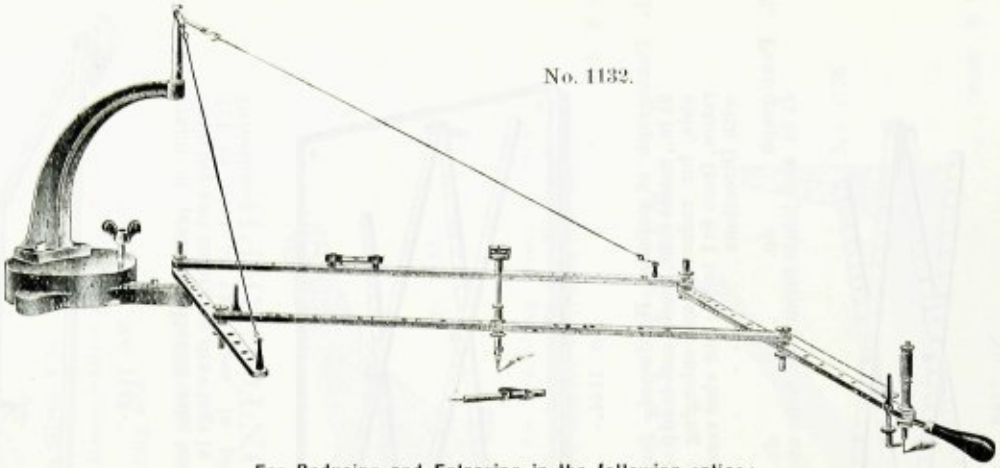
For Reducing from 20 : 1 to 5 : 4 or Enlarging from 1 : 20 to 4 : 5 in all ratios.

Suspended Pantograph of hollow, square metal bars, connected by cone joints; the bars are fully graduated and the edges of the sliding sockets are beveled to facilitate the reading of ratios. Tracing and Pencil Point are interchangeable. Plain solid iron Standard with 1 extra weight. Instrument with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 2 Steel Points, 1 Spirit Level, 1 Box of 5-inch Leads, Directions and Formula for computing the setting for any ratio. In Hardwood Case with Lock and key.

1129.	Length of Bars, 28 inches . . . . each	$ 75 00
1130.	" " " 33 " . . . . "	85 00
1131.	" " " 38 " . . . . "	92 50

SUSPENDED PANTOGRAPHS.

(PEARWOOD BARS)



No. 1132.

For Reducing and Enlarging in the following ratios:

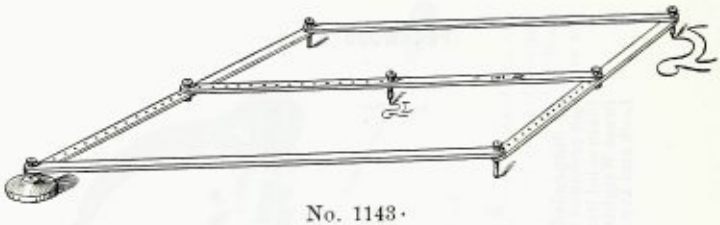
5:4, 4:3, 3:2, 5:3, 2:1, 5:2, 3:1, 4:1, 5:1, 6:1, 8:1, 10:1, 12:1, 20:1, or vice-versa.

Suspended Pantograph of strong well-seasoned Pearwood Bars, connected by cone joints in brass bearings and provided with holes accurately spaced for the above ratios, Tracing and Pencil Point are interchangeable. Plain solid iron Standard with 1 extra weight. Instrument with adjustable Tracing Point, Pencil Point with 3 Brass Weights, 1 Steel Point, 1 Spirit Level, 1 box of 5-inch Leads, and Directions. In Hardwood Case with Lock and key.

1132.	Length of Bars, 28 inches . . . . each	$ 35 00
1133.	" " " 33 " . . . . "	36 00
1134.	" " " 38 " . . . . "	37 50

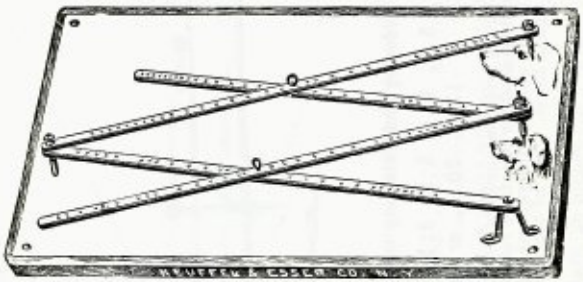
PANTOGRAPHS OF HARDWOOD

Pantographs 1143-1145 have our improved tracer and lead holders and take the usual Artist Lead, which is interchangeable with the steel tracer. These points are held by a screw sleeve. All metal parts are nickel plated.



No. 1143.

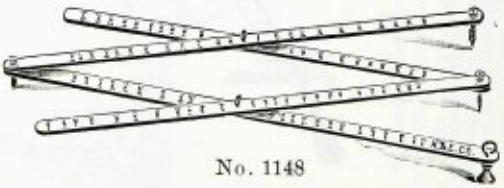
1143. Pantograph of polished Hardwood, bars 22½ in., for reducing and enlarging drawings in 15 ratios, from 2:1 to 16:1 or vice-versa, in plain box, with Directions . . . . . each $ 3 50



No. 1144.

1144. Pantograph of polished Hardwood, fancy lined, bars 21 in., metal foot; tracer and lead point interchangeable, for reducing and enlarging drawings in 34 ratios, from 8:1 to 1⅛:1 or vice versa, in plain box, with Directions . . . . . each $ 1 75

1145. Pantograph do. do. do. but bars 41 in. and joints formed by bolts and thumb nuts . " 5 00



No. 1148

1148. Pantograph of Hardwood, bars 21 in., improved lead-holder, plain tracer, in plain box, with Directions . each $ 1 20

ECCENTROLINEADS

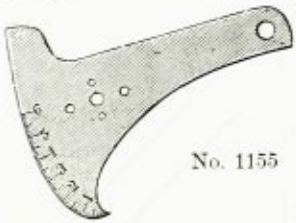


No. 1153

1150.	Eccentrolinead, German Silver, 9 in.	each	$ 3	25
1151.	do. " " 9 " with sliding arm .	"	4	00
1152.	do. Ebony, German silver mounted, 9 in. . .	"	2	75
1153.	do. " " " " 9 in. with sliding arm	"	3	25

See Note page 223 about Ebony.

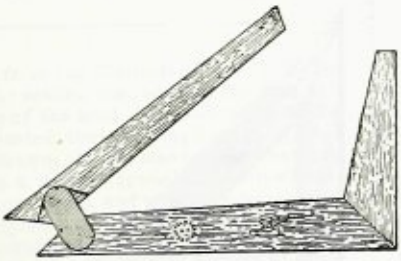
ODONTOGRAPH



No. 1155

1155. Templet Odontograph, for describing Teeth of Gear Wheels, a valuable instrument for Millwrights, Machinists, Pattern Makers, etc., with full description, in Case . . . . . each $ 3 50

DUPLEX ANGLE



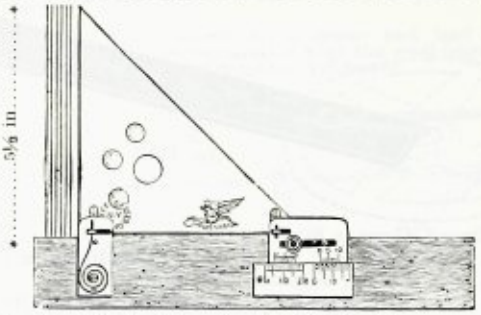
No. 1156

1156. Duplex Angle, mahogany, 7 in . . . . . each $ 1 25

The Duplex Angle is practically a right-angle triangle with a movable hypotenuse, the joint of which will retain, by friction, any angle to which it is set. It is therefore specially adapted for transferring or copying angles.

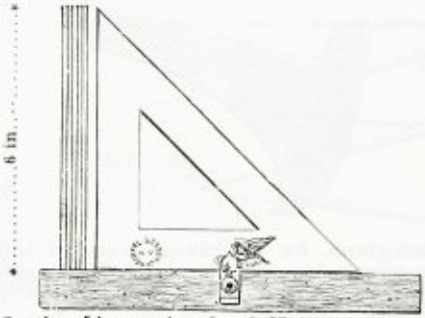
As the Duplex Angle is flush on both sides it can be used for drawing equal angles in opposite directions, a great advantage in drawing roof pitches, teeth of gear wheels, sides of taper arms of wheels, polygons, etc.

SECTION LINERS.



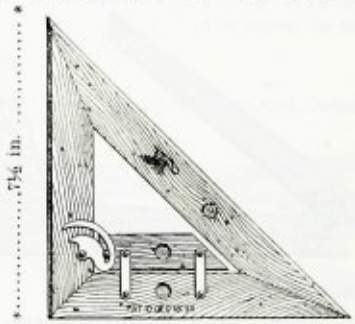
No. 1157.

1157. Casey's Section Liner, triangle of Xylonite (transparent), straightedge of boxwood, German silver Mountings, a very reliable and simple instrument. There is hardly any practice required to operate it to perfection. By the 2 scales with verniers on the metal plates, the distances are regulated to $\frac{1}{100}$th inch or $\frac{1}{10}$th millimeter, ... each $ 3 50



No. 1158.

1158. William's Section Liner, triangle of Xylonite (transparent), straightedge of Boxwood, a simple and practical instrument which after a little practice will be found to work very satisfactorily . . . . . each $ 2 00



No. 1158½.

1158½. Hill's Section Liner, pearwood. Patented. The width of the spacing can be instantly adjusted by rotating the cam-shaped piece shown in the cut. A simple and reliable instrument . . . . . each $ 1 00

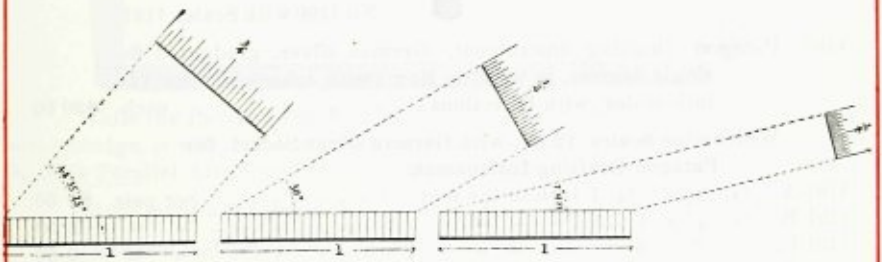
BOTH'S PATENT SECTION LINER AND SCALE DIVIDER



1159. Both's Patent Section Liner and Scale Divider, **German Silver**, base 14¾ in. Protractor graduated to degrees. Instrument in wooden Case, with full Directions for setting and using . . . . . each $ 12 00

1160. Both's Patent Section Liner, as above, but with Vernier to the protractor, reading to five minutes . . . . . " 13 00

The essential parts of Both's Patent Section are: a flat rack bar 14¾ in. long, bearing an accurately cut rack 9 in. long with 24 teeth to the inch and a nicely fitted carriage made to slide on the rack bar; to this are attached the semi-circular protractor graduated to degrees, the pivoted ruler arm extending 10 in. beyond the protractor, and the mechanism for uniformly advancing the ruler arm. This mechanism consists of a steel pawl which engages in the teeth of the rack bar, taking from one to six teeth at a time, according to the take up to which the adjusting nut has been set. The slide and with it the ruler arm, are made to advance on the rack bar by pressing on a knob which causes the pawl to engage in a tooth of the rack.

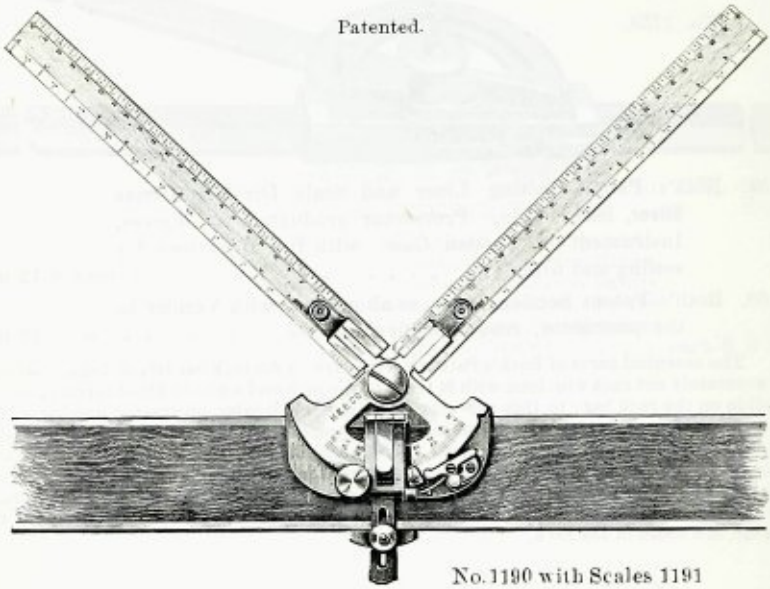


It will be evident from the illustration, that if the ruler arm is set at a right angle to the rack bar (shown by setting the index on the arm to 90° of the protractor) it will move with each pressure of the knob a distance equal to the number of teeth for which the take up has been adjusted, thus enabling lines $\frac{1}{24}$, $\frac{1}{12}$, $\frac{1}{8}$, $\frac{1}{6}$ or $\frac{1}{4}$ inches apart to be both accurately and rapidly drawn. It will also be clear that if the arm is set at an angle less than 90°, as shown in Fig. 2, that the space between the lines will also be less, diminishing as the angle becomes more acute, and that we may consequently establish any desired ratio between the rack scale (24 to the inch) and the drawn scale as reduced by the angle of the ruler arm. This ratio is the natural sine of the angle formed by the ruler arm and the rack bar.

The comfort and satisfaction attending the use of this instrument, the assurance of being able to do absolutely accurate work in less time than with any other, its easy adjustment for section-lining or for scales, its great scope, together with durability and neatness, make it without exception a superior instrument and a valuable and most useful addition to the outfit of every draughtsman who knows and appreciates the value of good tools.

PARAGON DRAFTING INSTRUMENT.

Patented.



No. 1190 with Scales 1191

1190. Paragon Drafting Instrument, German silver, graduated to single degrees, in wooden Box (with spaces for six 12-inch scales), with Directions . . . . . each $20 00

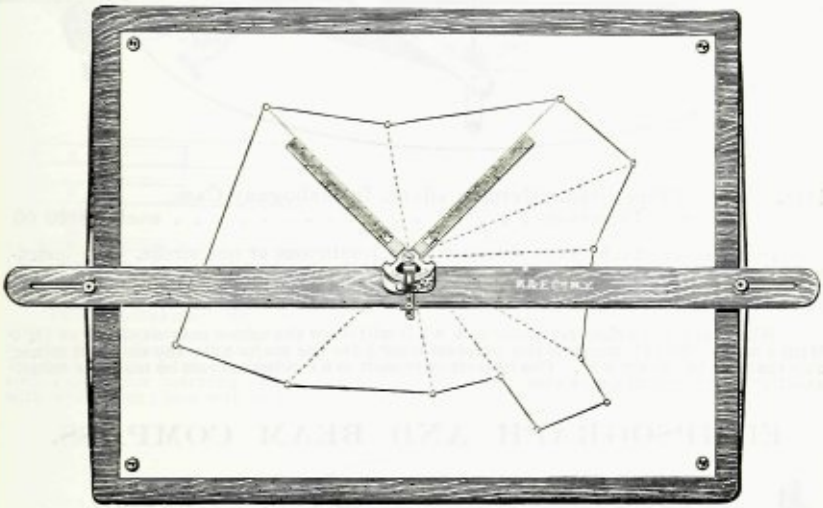
White-edge Scales, 12 in., with German silver Socket, for Paragon Drafting Instrument.

1191-A.	1/8, 1/4 × 1/2, 1 inch to the foot . . . . . per pair	$2	50
1191-B.	3/8, 3/4 × 1 1/2, 3 " " " " . . . . . " "	2	50
1191-C.	3 × 6 " " " " . . . . . " "	2	50
1191-D.	1/8, 1/4 × 1/2, full size . . . . . " "	2	50
1191-E.	20, 40 × 30, 60 parts to the inch . . . . . " "	2	50
	Scales with other graduations made to order . . . . " "	3	50

The Paragon Drafting Instrument replaces nearly all the tools usually employed in drafting, such as triangle, protractor, scale, etc., and places these tools in immediate command of the draftsman at any place on the drawing board where he wants to apply them. The instrument is instantly shifted to reach any part of the drawing board, and angles can be set off anywhere on the board without locating their apex. Lines are located, drawn and measured in one operation. It is a labor and time saving device with which **accurate** work can be done quickly and conveniently.

The instrument can be used on **any straightedge or T square** from 1-7/8 to 2-7/8 in. wide, to which it is easily attached. It is freely movable along the straightedge, or firmly held at any point by a convenient brake. The German silver protractor (quadrant) is graduated to single degrees numbered in both directions, and has a clamp screw. It is provided with a spring stop to quickly set it to 30, 45, 60, or 90 degrees.

The scales, when attached to the instrument, form a movable right angle and are easily interchanged. They have white-lined bevels with two divisions **on each edge** except No. 1191 C, which has 1 division **on each edge**. Either edge of either scale can be used.



While the Paragon Drafting Instrument can be used with a T square or straightedge, it will be found most convenient to use it in connection with the K & E Parallel Attachment (No. 2549, page 245).

Of the many advantages of the Paragon Drafting Instrument we mention:

The same instrument will cover any size of drawing.

Any part of the board can be readily reached.

A line can be laid out at any angle without starting it from the apex of the angle.

Lines are located, drawn and measured in one operation.

It can be applied and removed as easily as a triangle.

No parts of the instrument project beyond the board or are fastened to it.

It can be set to the most frequently used angles in an instant.

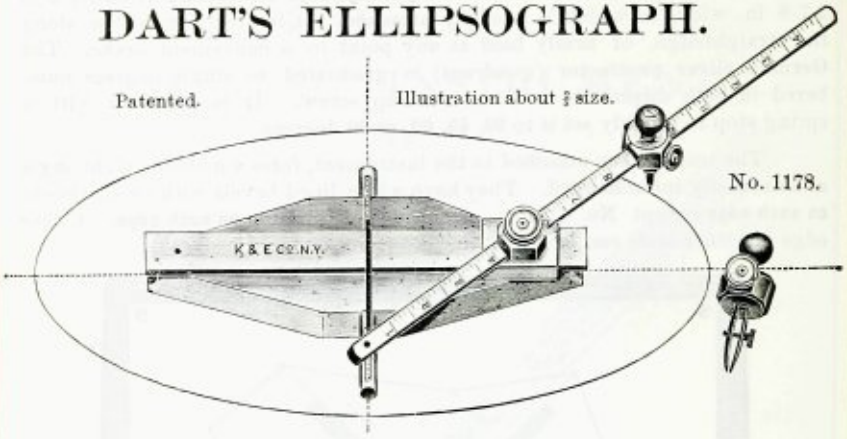
The scales are as easily attached or exchanged as a compass part.

It is a combination of tools with which every draftsman is familiar.

DART'S ELLIPSOGRAPH.

Patented.

Illustration about ⅛ size.



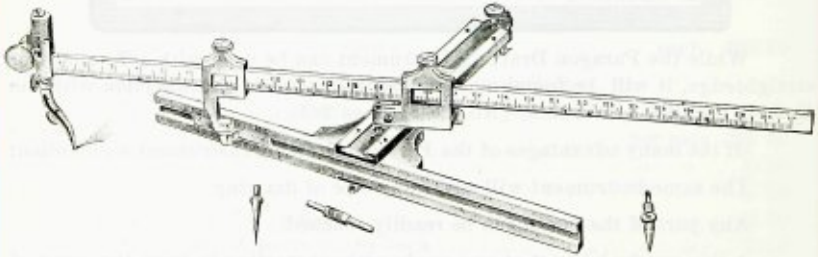
No. 1178.

1178. Dart's Ellipsograph, German silver, in mahogany Case, with Directions . . . . . each $ 20 00

Dart's Ellipsograph draws correct ellipses continuous at one stroke. The instrument consists of a base with sliding cross-bar, slide for head of beam, graduated beam, pen point and pencil and scribing point. The heavy base has two adjustable holding pins projecting from its lower surface to hold it in place while drawing.

When set for the shortest major axis 6", it will draw the minor axis as short as 1¾". With a setting for 14" which is the greatest length for the major axis, the shortest minor axis that can be drawn is 9". The nearest approach to a circle that can be made, is minor axis 1¼" shorter than major axis

ELLIPSOGRAPH AND BEAM COMPASS.



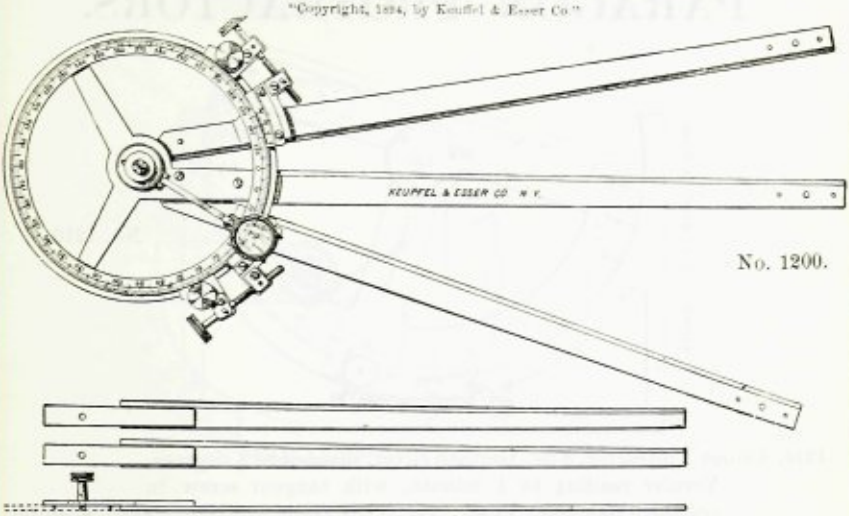
No. 1180.

1180. German silver Ellipsograph, fine quality 12-inch bar graduated 32nds inches on one side and millimeters on the other, with 2 Pen Points, 1 Pencil Point, 3 Steel Points, in morocco Case . . . . . each $ 25 00

This instrument draws ellipses of any shape, from ½ inch up to 22 inches major axis, with the greatest accuracy. Its construction is shown by the illustration. The graduated bar with the runners can be removed from the frame and a needlepoint inserted into one of the runners, when it forms a light, but strong Beam Compass. The Ellipsograph, also the T-shaped frame, can be taken apart and stored compactly in its morocco Case.

METAL PROTRACTORS

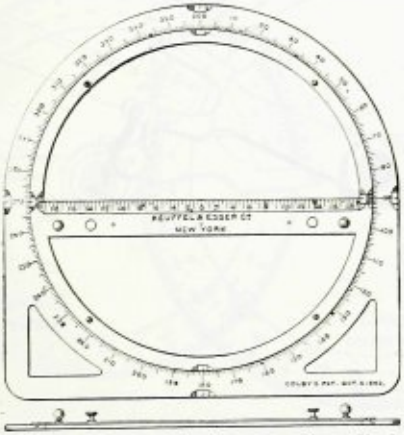
"Copyright, 1894, by Keuffel & Esser Co."



No. 1200.

1200. Three-Arm Protractor or Station Pointer, Instrument in substantial wooden Case, with Screwdriver . . . . each $ 90 00

Protractor as made by us for the U. S. Navy, Bronze Circle 6½ in., divided on silver to ½ degrees, numbered in opposite directions from 0 to 350 and from 360 to 10, with 2 verniers reading to 1 minute. Both verniers with tangent screw. Magnifying lens on central arm. Tubular centre ⅞ in. diameter, with glass bottom, removable cylinder for centre with spring-point for marking centre exactly. Three German silver arms, 17 in. long, each with extension piece with setscrew to lengthen to 27½ in. beyond edge of circle.



No. 1209.

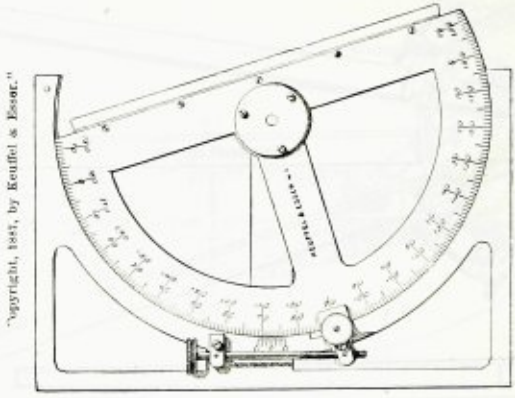
1209. Colby's Protractor, (Patented), German silver limb 12 in., divided to 15 minutes, Scale graduated as required, in Mahogany Case . . . . . each $ 60 00
Extra Scales, with any of the usual graduations . . . . . " 3 50

This instrument can be used for all kinds of protracting, but it is especially designed for plotting notes of surveys made with the stadia.

The limb is graduated from 0° to 360°, 15 minutes divisions. Scale on cross-arm has zero mark in centre, and is graduated in both directions in any unit desired. The revolving inner circle with the cross-arm is raised to prevent friction on the paper.

To hold instrument in position, paper weights are placed on the corners of the outer plate.

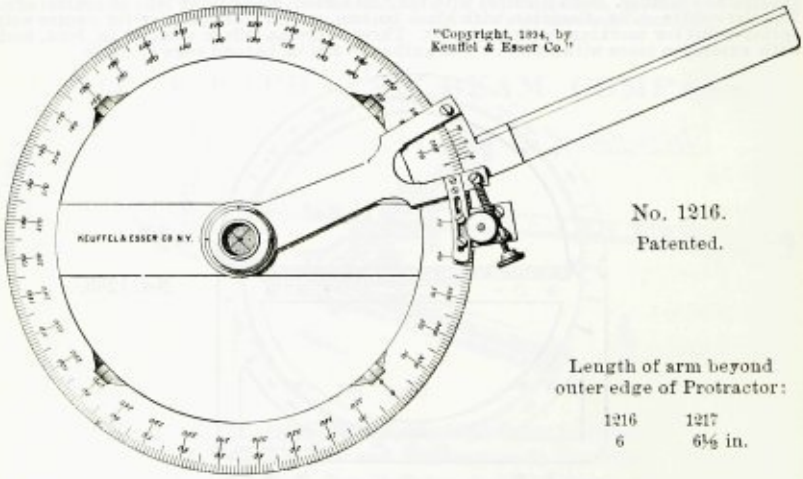
PARAGON PROTRACTORS.



No. 1210.

1210. Crozet Protractor, 8 in., German silver, divided to ¼ degrees, Vernier reading to 1 minute, with tangent screw, in polished Mahogany Case . . . . . each $ 40 00

This is a very practical protractor. It is used along a straightedge or T square and angles are set off without bringing the centre over the starting point.



No. 1216.
Patented.

Length of arm beyond outer edge of Protractor:

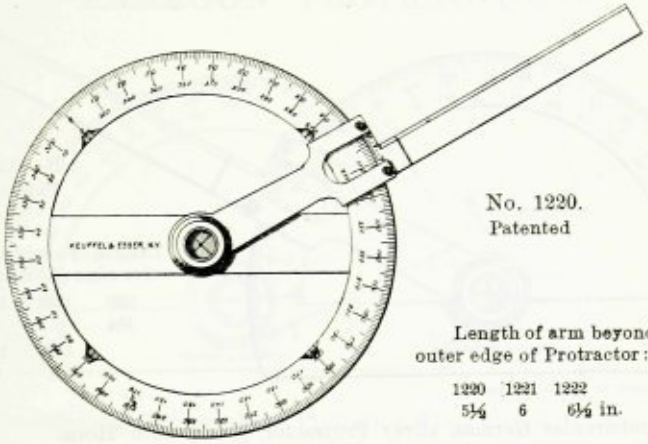
1216	1217
6	6½ in.

1216. Circular German silver Protractor, 8 in., Horncentre and Movable Arm, with **Tangent Screw,** div. to ¼ degrees, Vernier reading to 1 minute, each $ 20 00

1217. do. do. 10 in. " " ¼ " " " " 1 " " 24 00

Polished Mahogany Case for No. 1216 1217
each $ 2 50 2 75

PARAGON PROTRACTORS.

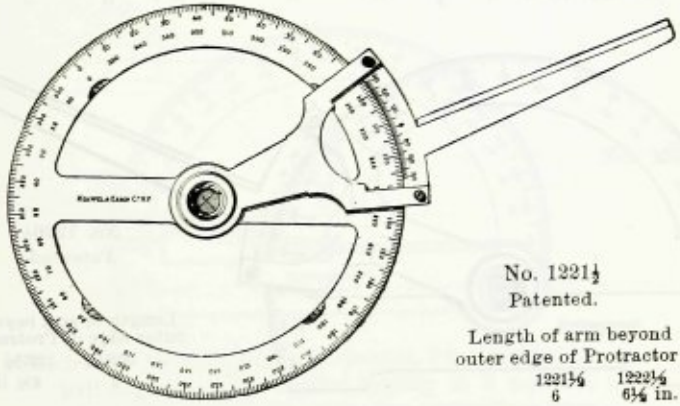


No. 1220.
Patented

Length of arm beyond outer edge of Protractor:

1220	1221	1222
5½	6	6½ in.

1220. Circular German silver Protractor, 6 in., with Horncentre and Movable Arm, div. to ½ degrees, Vernier read'g to 3 min., each $ 14 00
1221. do. do. 8 in., " " ¼ " " " " 1 " " 16 00
1222. do. do. 10 " " " ¼ " " " " 1 " " 20 00



No. 1221½
Patented.

Length of arm beyond outer edge of Protractor:

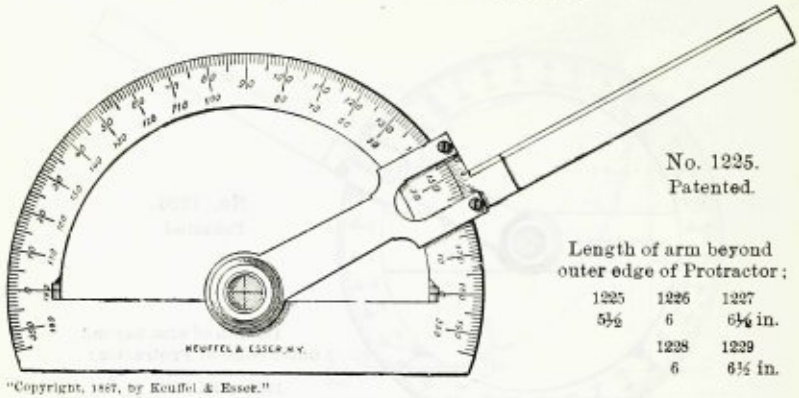
1221½	1222½
6	6¼ in.

1221½. Circular German silver Protractor, 8 in., with Horncentre and Movable Arm, div. to ½ degrees, Vernier read'g to 1 minute, each $ 17 25
1222½. do. do. 10 in. " ½ " " " " 1 " " 21 25

The divisions of protractors 1221½ and 1222½ are again as open as of those divided to ¼ degrees reading to 1 minute Their verniers are therefore twice as long as those of the latter.

Polished Mahogany Case for	No. 1220,	1221,	1222,	1221½,	1222½.
each	$ 2 25	2 50	2 75	2 50	2 75

PARAGON PROTRACTORS.



No. 1225.
Patented.

Length of arm beyond outer edge of Protractor;

1225	1226	1227
5½	6	6½ in.
	1228	1229
	6	6½ in.

"Copyright, 1887, by Keuffel & Esser."

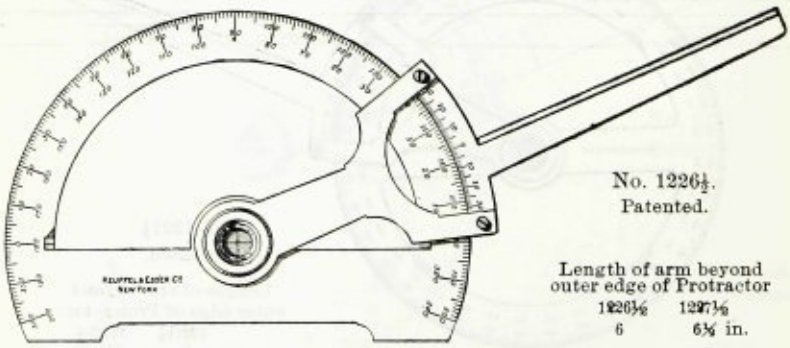
1225. Semicircular German silver Protractor, 6 in., with Horn-centre and Movable Arm, div. to ½ degrees, Vernier read'g to 3 minutes, each $ 10 00

1226. do. do. 8 in. " ¼ " " " " 1 minute, " 14 00

1227. do. do. 10 " " ¼ " " " " 1 " " 17 00

1228. do. do. with **Tangent Screw** (see cut No. 1216 page 168), 8 in. div. to ¼ degrees, Vernier read'g to 1 minute, " 18 00

1229. do. do. 10 " " ¼ " " " " 1 " " 21 00



No. 1226½.
Patented.

Length of arm beyond outer edge of Protractor

1226½	1227½
6	6½ in.

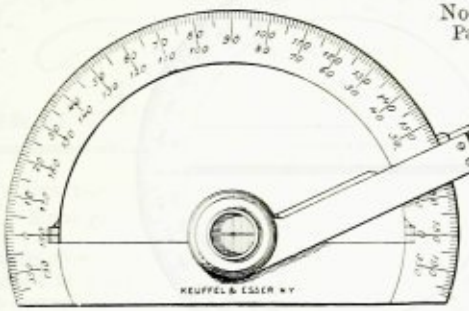
1226½. Semicircular German silver Protractor, 8 in., with Horn-centre and Movable Arm, div. to ½ degrees, Vernier read'g to 1 minute each $ 15 25

1227½. do. do. 10 in., " " ½ " " " " 1 " " 18 25

The divisions of protractors 1226½, 1227½ are again as open as of those divided to ¼ degrees reading to one minute. Their verniers are therefore twice as long as those of the latter.

Polished Mahogany Case for No.	1225	1226	1227	1228	1229	1226½	1227½
each	$ 1 75	2 00	2 25	2 00	2 25	2 00	2 25

PARAGON PROTRACTORS.



No. 1230.
Patented

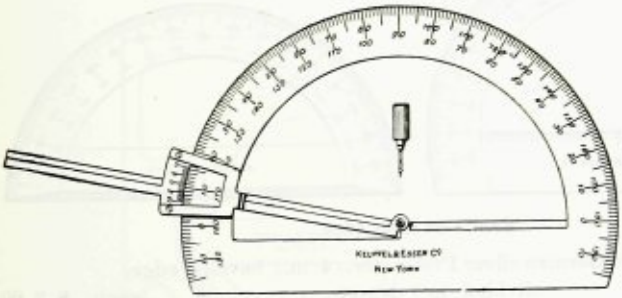
Length of arm beyond outer edge of Protractor:

1230	1231
6	6½ in.

1230. Semicircular German silver Protractor, 6 in., with Horn-centre and Movable Arm, divided to ½ degrees, each $ 8 75

1231. do. 7 in. do. do. divided to ½ degrees, " 10 00

Polished Mahogany Case for No. 1230 1231
each $ 1 75 2 00

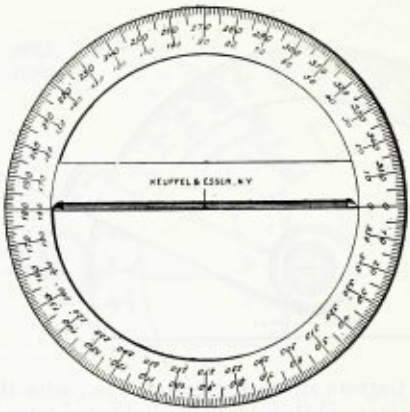


No. 1234.

1234. Semicircular German silver Protractor, 5 in , divided to half-degrees, with vernier reading to 3 minutes, perforated centre, Movable Arm extending from ⅛ inch beyond centre to 2 inches beyond outer edge, in cloth covered velvet lined Box, with Pricker. . . . . each $ 9 00

Protractor No. 1234 is very light, and handy for field work, for orienting, plotting, &c as it has the advantage that radii can be drawn very nearly to the centre. The centre is perforated and with the pricker furnished with the instrument the centre can be set exactly on a given point and the point marked.

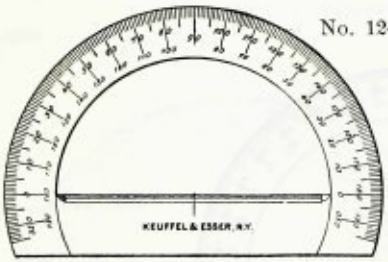
PARAGON PROTRACTORS.



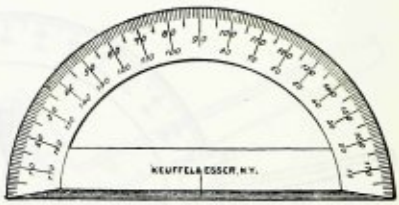
"Copyright, 1887, by Keuffel & Esser."

No. 1235.

1235. Circular German silver Protractor, 5 in., beveled edge, divided to ½ degrees . . . . . each $ 5 50



No. 1240.



No. 1245.

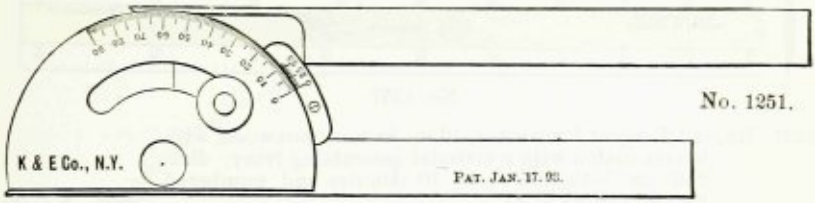
Centre on inner edge

1240.	Semicircular German silver Protractor, 4 in., beveled edge, divided to 1 degree, ...						each	$ 2 00
1241.	do.	5 in.,	"	"	½	"	"	2 50
1242.	do.	6 "	"	"	½	"	"	3 00
1243.	do.	6 "	"	"	¼	"	"	4 00

Centre on outer edge

1245.	Semicircular German silver Protractor, 4 in., beveled edge, divided to 1 degree, ...						each	$ 1 50
1246.	do.	5 in ,	"	"	½	"	"	2 00
1247.	do.	6 "	"	"	½	"	"	2 75
1248.	do.	6 "	"	"	¼	"	"	3 50
1249.	do.	7 "	"	"	½	"	"	3 75
1250.	do.	8 "	"	"	½	"	"	4 50

DRAFTSMAN'S LIMB PROTRACTOR



No. 1251.

1251. Draftsman's Limb Protractor, German silver, ... each $ 10 00
Mahogany Case for No. 1251 . . . . . " 1 50

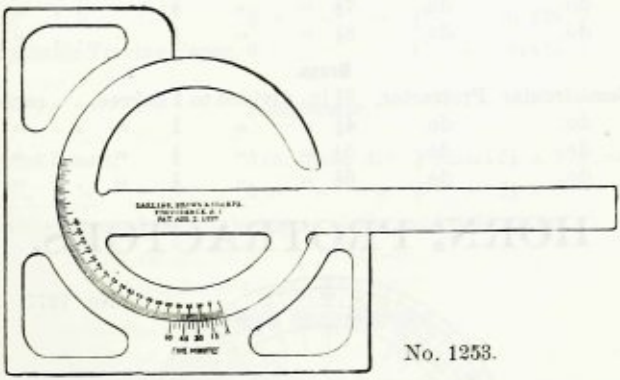
This Protractor has blades about 9 inches long. The arc is of 4 in. diameter, graduated to degrees, with vernier reading to 5 minutes. It has a clamping screw which securely holds the blades at any angle and serves as knob handle.

Either blade can be used in contact with T square, giving any angle and its complement from 0° to 90°.

It forms a perfect adjustable triangle, and is a finely finished, engine divided tool designed for draughtsman's use and of greater precision and finer workmanship than the steel protractor of like design, No. 1252.

STEEL PROTRACTORS

1252. Machinist's Limb Protractor, similar to No. 1251, but of steel (see paragraph above) . . . . . each $ 4 00
do. do. do. in mahogany Case . . . " 5 00

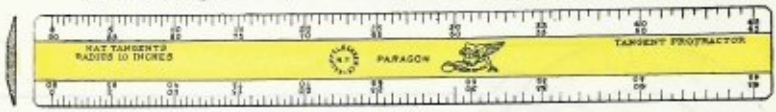


No. 1253.

1253. Draftsman's Steel Protractor, with Directions . . . . . each $ 6 50
do. do. do. in morocco Case . . . . . " 7 75

This Protractor is of sheet steel, graduated on one side to degrees, with vernier reading to 5 minutes. The blade is 8 ½ inches long. It is used chiefly in connection with a T square or Straight Edge. Being perfectly flush on both sides, it can be used either side up and on either edge of the blade. This makes it particularly convenient in dividing circles, transferring angles, drawing oblique lines at right angles to each other or laying off given angles on each side of a line without changing the setting.

TANGENT PROTRACTOR

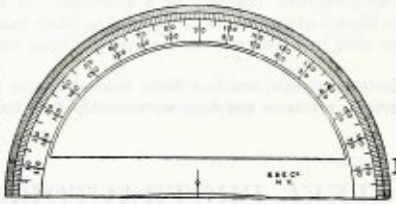


No. 1257.

1257. Rogers' Tangent Protractor, 10 in. radius, boxwood, with bevels coated with a material resembling ivory, divided on both edges to 10 minutes and numbered 0 to 45 and 45 to 90° . . . . . each $ 3 00

A very convenient and accurate instrument for plotting angles and an efficient substitute for a vernier protractor.

PLAIN METAL PROTRACTORS



No. 1262.

German Silver.

1260N.	Semicircular	Protractor,	4¼	in.,	divided to	1	degree,	each	$ 40
1261N.	do.	do.	5⅛	"	"	½	"	"	60
1262N.	do.	do.	6⅜	"	"	½	"	"	80
1263N.	do.	do.	7½	"	"	½	"	"	1 15
1264N.	do.	do.	8½	"	"	½	"	"	1 50

Brass.

1265N.	Semicircular	Protractor,	3¾	in.,	divided to	1	degree,	each	$ 09
1266N.	do.	do.	4¼	"	"	1	"	"	25
1267N.	do.	do.	5⅛	"	"	½	"	"	50
1268N.	do.	do.	6⅜	"	"	½	"	"	70

HORN PROTRACTORS.

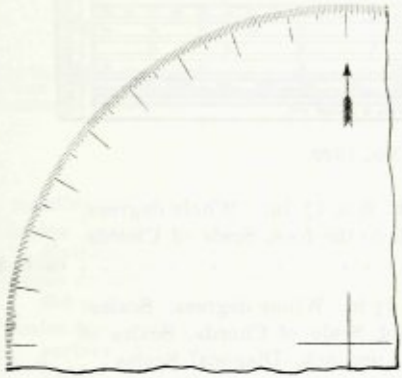


No. 1277.

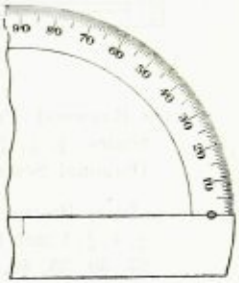
1276.	Semicircular	Horn Protractor,		4¼	in.,	divided to	1	degree,	each $ 14
1277.	do.	do.	do.	5¼	"	"	½	"	" 25
1279.	do.	do.	do.	6¼	"	"	½	"	" 30
1281.	do.	do.	do.	7	"	"	½	"	" 40

Horn Protractors will not lie as flat as Xylonite Protractors.

PAPER PROTRACTORS



Imprint on
1293 to 1295



Imprint on
No. 1297

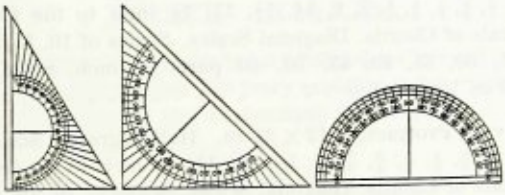
Circular.

1293.	Vegetable Tracing Paper,	14 in. diam. div.	¼°	Sheet 15½x21 in., each	$ 30
1294.	Drawing Paper,	14 " " "	¼°	" 15½x20 " "	30
1295.	Bristol Board,	14 " " "	¼°	" 16½x20 " "	40
1296.	" "	8 " " "	½°	" 10 x12 " "	20
1296T.	Vegetable Tracing Paper,	8 " " "	½°	" 9½x12 " "	20

Semicircular.

1297.	Bristol Board,	5 in. diam. div.	½°	Sheet 5½ x 7 in., each	$ 10
1298.	" "	5 " " "	½°	" 6¼ x 8 "	
	with Diagonal Scales, inches to $\frac{1}{100}$ths, and millimeters . .			"	15

XYLONITE PROTRACTORS.



For Xylonite Protractors (transparent) see pages 214, 215.

BOXWOOD AND IVORY PROTRACTORS.



No. 1320.

1310. Square Boxwood Protractor, $6 \times 1\frac{3}{4}$ in. Whole degrees, Scales: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch to the foot, Scale of Chords, Diagonal Scales . . . . . each $ 35

1320. Square Ivory Protractor, $6 \times 1\frac{3}{4}$ in. Whole degrees. Scales: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch to the foot, Scale of Chords, Scales of 25, 30, 35, 40, 45 parts per inch, Diagonal Scales . . " 1 60

1321. Square Ivory Protractor, $6 \times 1\frac{3}{4}$ in. Whole degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1 inch to the foot, Scale of Chords, Diagonal Scales, Scales of 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 2 00

1322. Square Ivory Protractor, 6×2 in. Whole degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$ $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{1}{2}$ inch to the foot, Scale of Chords, Diagonal Scales, Scale of 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 4 35

1323. Square Ivory Protractor, $6 \times 2\frac{1}{2}$ in. Half degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$ inch to the foot Scale of Chords, Diagonal Scales, Scale of 10, 15, 20, 25, 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 5 00

1324. Square Ivory Protractor, 8×2 in. Whole degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1 inch to the foot, Scale of Chords, Diagonal Scales, Scales of 20, 25, 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 5 50

1325. Square Ivory Protractor, $8 \times 2\frac{1}{2}$ in. Half degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$ inch to the foot, Scale of Chords, Diagonal Scales, Scales of 10, 15, 20, 25, 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 7 00

1326. Square Ivory Protractor, $12 \times 2\frac{1}{2}$ in. Half degrees. Scales: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{8}$, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$ inch to the foot, Scale of Chords, Diagonal Scales, Scales of 10, 15, 20, 25, 30, 35, 40, 45, 50, 60 parts per inch, Scale of 40 on lower edge . . . . . " 11 50

PARAGON AND BOXWOOD SCALES.

Machine-divided. U. S. St'd.

The U. S. St'd. machine-divided Paragon and Boxwood Scales manufactured by us, are of the best selected material, of proper width and thickness, and of finest finish. They are superior in quality and accuracy to any others on the market.

FLAT SCALES

have manifest advantages over those of triangular or other shape.

Flat Scales lessen the liability to error arising from employing the wrong division.

Flat Scales do not require careful searching for the division wanted, each time the scale is applied.

Flat Scales last much longer than triangular scales, because there is no divided surface in contact with the drawing. (This does not apply to our Patent Triangular Scales, in which the divided surfaces are beveled inwards, to raise them from the paper. See cut page 190.)

Flat Scales can be replaced at less cost than triangular.

Flat Scales can be selected to have only those divisions which are required, instead of a number of other additional divisions, which may never be wanted.

Flat Scales are more convenient to hold in position on the drawing.

Flat Scales present the graduations nearly on a plane with the drawing and not at an inconvenient angle.

We call attention also to the length of scales. For drawings $\frac{1}{4}$ inch to the foot or smaller a 12-inch scale will answer the purpose well, but for drawings made to a larger scale, an 18-or even 24-inch scale will be necessary in order to avoid errors from repeating the scale in setting off one measurement. We would therefore recommend 12-inch as the best length for $\frac{1}{4}$ inch to the foot or smaller, 18-inch as the best length for $\frac{3}{8}$ to 2 inch to the foot, and 24-inch for still larger scales.

BEVELS ON OPPOSITE SIDE.

We furnish any of our flat scales with the two bevels on opposite sides () and carry some of the more frequently used scales of this style in stock. (See No. 1391PR. &c.)

IVORY SCALES.

As the demand for ivory scales is very limited, we have discontinued them in our catalogue, but will furnish flat ivory scales to order, with any divisions. Prices, which are subject to the fluctuations in the price of ivory, will be quoted on application.

(**See Special Scales, page 187**).

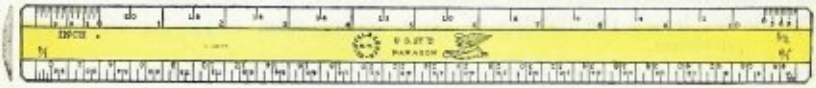
Each Scale Stamped Paragon.

OPEN DIVIDED PARAGON SCALES.

Machine Divided, U. S. St'd.

Paragon Scales are made of the best seasoned Boxwood. The bevels are coated with a material resembling ivory, which will permanently remain white and is not liable to shrink. The Paragon Drafting Scales are a great and decided improvement over all other scales now in use. They combine durability and distinctness, and will not tire nor injure the eyes, because they are even more distinct and legible than Ivory Scales, without their liability to shrink or warp.

DIVIDED: INCH TO THE FOOT.



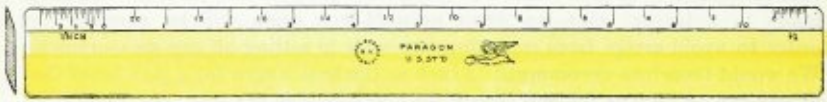
No. 1391 P. "Copyright, 1887, by Keuffel & Esser."

DIVIDED: ½, ¼, ⅛, 1 INCH TO THE FOOT.

1390 P.	Flat Paragon Scale,	6 in.	. . . . .	each	$ 75
1391 P.	do.	12 "	. . . . .	"	1 25
1392 P.	do.	12½ "	. . . . .	"	1 35

Scale No. 1392P has the advantage of covering 100 feet on ⅛ inch, 50 feet on ¼ inch, and 25 feet on ½ inch scale.

1393 P.	Flat Paragon Scale,	18 in.	. . . . .	each	$ 2 25
1394 P.	do.	24 "	. . . . .	"	3 00
1395 P.	do.	24 " div. ½, ¼ in. to the foot and ⅒th inch full size	. . . . .	"	3 00



No. 1391PR.

1391PR.	Flat Paragon Scale,	12 in., **bevels on opposite sides**	. . .	each	$ 1 25
1392PR.	do.	12½ in., " " " "	. . .	"	1 35



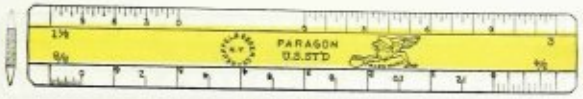
No. 1396 P. "Copyright, 1887, by Keuffel & Esser."

DIVIDED: ½, ¼, 1⅛, 3 INCHES TO THE FOOT.

1396 P.	Flat Paragon Scale,	12 in.	. . . . .	each	$ 1 25
1397 P.	do.	18 "	. . . . .	"	2 25
1398 P.	do.	24 "	. . . . .	"	3 00
1396PR.	do.	12 " **bevels on opposite sides**	. . .	"	1 25

Flat Paragon Scales with other divisions, one or **both sides divided**, made to order, see page 187.

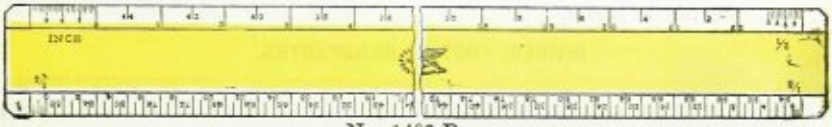
Each Scale Stamped Paragon.



No. 1399 P.

1399 P. Flat Paragon Pocket Scale, 6 in., **both sides beveled and divided,** $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, 1 × $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 inches to the foot, in leather Sheath . . . . . each $ 1 35

Scales 1399 P. are less than one inch wide and very convenient for the pocket. They have all the usual scales employed by the building professions.



No. 1402 P.

1400 P. Flat Paragon Scale, 12 in., **both sides beveled and divided,** $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 × $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 inches to foot . . . . . each $ 2 00

1401 P. " 18 " " " " " " " " 3 50

1402 P. " 24 " " " " " " " " 4 75

PARAGON CHAIN SCALES.

Machine Divided, U. S. St'd.

DIVIDED: INCHES AND TENTHS.



No. 1415P.

"Copyright, 1887, by Keuffel & Esser."

1410 P. Flat Paragon Chain Scale, 6 in., div. 10×50 parts to the inch, each $ 75

1411 P. do. 6 " " 20×40 " " " " " 75

1412 P. do. 6 " " 30×60 " " " " " 75

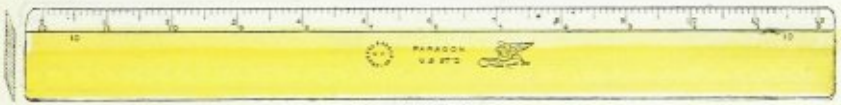
1413 P. do. 6 " " 80×100 " " " " " 1 00

1415 P. do. 12 " " 10×50 " " " " " 1 25

1416 P. do. 12 " " 20×40 " " " " " 1 25

1417 P. do. 12 " " 30×60 " " " " " 1 25

1418 P. do. 12 " " 80×100 " " " " " 1 50



No. 1415PR.

1415PR. Flat Paragon Chain Scale, **bevels on opposite sides,** 12 in. div. 10×50 parts to the inch, each $ 1 25

1416PR. do. 12 " " 20×40 " " " " " 1 25

1417PR. do. 12 " " 30×60 " " " " " 1 25

1418PR. do. 12 " " 80×100 " " " " " 1 50

Flat Paragon Scales with other divisions, one or **both sides divided,** made to order, see page 187.

Each Scale Stamped Paragon.

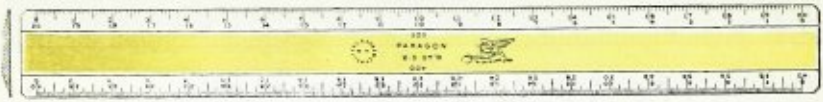


No. 1419 P.

1419 P. Flat Paragon Pocket Scale, 6 in., **both sides beveled and divided,** div. 10, 40, 30 and 50 parts to the inch, in leather Sheath . . . . . each $ 1 35

Scales 1419 P, are less than one inch wide and very convenient for the pocket.

DIVIDED: FOOT IN HUNDREDTHS.



No. 1426P.

1425 P. Flat Paragon Chain Scale, 12 in., div. 100×500 parts to the foot . . . . . each $ 1 25
1426 P. do. 12 " " 200×400 " " " " . . . . . " 1 25
1427 P. do. 12 " " 300×600 " " " " . . . . . " 1 25
1428 P. do. 12 " " 800×1000 " " " " . . . . . " 1 50

DIVIDED: METRIC MEASURE.



No. 1462 P.

1460 P. Flat Paragon Scale, 10 cm., div. mm. and half-mm . . . . each $ 75
1461 P. do. 20 " " " " " " " . . . . " 1 00
1462 P. do. 30 " " " " " " " . . . . " 1 25
1463 P. do. 50 " " " " " " " . . . . " 2 25

DIVIDED: INCHES AND METRIC MEASURE.



No. 1472 P.

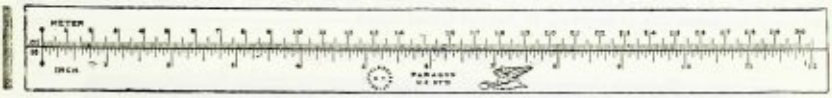
1472 P. Flat Paragon Scale, 30 cm., div. 32nds. in. and half-mm each $ 1 50
1473 P. do. 50 " " " " " " " . . . " 2 50

These scales are divided in inches on one edge and in metric measure on the other, which makes them very convenient for converting plans from one system into the other.

Flat Paragon Scales with other divisions, one or **both sides divided,** made to order, see page 187.

Each Scale Stamped Paragon.

METRIC COMPARING SCALE.



No. 1482 P.

1482 P. Flat Paragon Scale, (white facing) 30 cm., inch and metric comparing scale, div. mm. and 16ths in. on median line, (no bevels) . . . . . each $ 1 50

1483 P. do. do. do. like No. 1482 P, but 50 cm. . . . " 2 50

DIVIDED: DIAMETER AND CIRCUMFERENCE.



No. 1480 P.

1480 P. Flat Paragon Scale, 12 in., divided for diameter and circumference . . . . . each $ 1 75

One edge of this scale is divided in inches to thirty-seconds, the other to spaces 3.1416 in. to 128ths. The divisions of the two edges are in the ratio of diameter to circumference of a circle.

UNDERWRITER'S SCALE.



No. 1487.

1486. Underwriter's Scale, flat, **transparent** xylonite, 6 in., both edges beveled, and divided 10 parts to the inch; the inch graduations are carried across the scale . . . . each $ 1 50

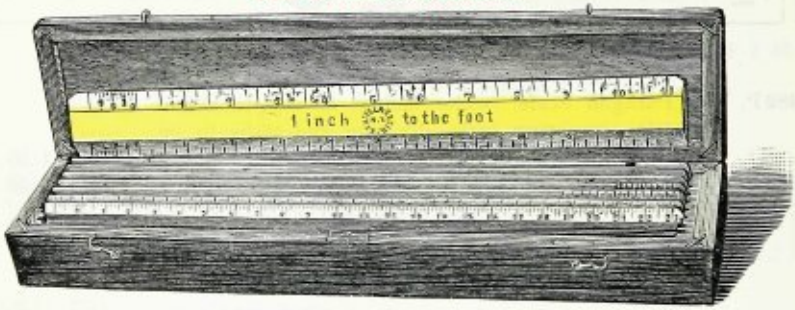
1487. Underwriter's Scale, flat, like No. 1486, but 12 in. . . . " 2 00

Flat Paragon Scales with other divisions, one or **both sides divided** made to order, see page 187

PARAGON SCALES IN SETS.

Flat Scales in Sets represent the most perfected form of Draftsman's Scales. They are put up and arranged in a manner to make their use the most practical, time saving and economical. The Scales are arranged as the illustration shows in a neat and strong mahogany box with a separate space for each scale plainly numbered so that the scale of the desired division can be found at a glance. In this manner the scales, which are as valuable and more delicate than compasses and dividers, are protected as well as the latter. It is unreasonable that scales should be allowed to take care of themselves, while compasses are preserved in velvet-lined cases.

Each Scale Stamped Paragon.



OPEN DIVIDED PARAGON SCALES.

Each Scale has the same division on both edges, one edge reading from left to right, the other edge from right to left. See figure C, page 187:

1575 P.	Set of 4 Paragon Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot	set	$6 25
1576 P.	Set of 8 Paragon Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot . . .	"	11 50
1577 P.	Set of 12 Paragon Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 inches to the foot and $\frac{1}{12}$ inch full size	"	17 00
1578 P.	Set of 4 Paragon Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot	"	10 75
1579 P.	Set of 8 Paragon Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot . . .	"	20 25
1580 P.	Set of 12 Paragon Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 inches to the foot and $\frac{1}{18}$ inch full size	"	30 00

PARAGON CHAIN SCALES.

Each Scale has two different divisions, one on each edge, each of which is numbered to read both ways. See figure D, page 188:

1584 P.	Set of 4 Paragon Scales, 12 in. divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch	set	6 75

Each Scale has only one division, the same on both edges, and is numbered to read both ways on each edge:

1592 P.	Set of 6 Paragon Scales, 12 in. divided: 10, 20, 30, 40, 50, 60 parts to the inch	set	9 00
1593 P.	Set of 8 Paragon Scales, 12 in. divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch	"	13 00

PARAGON METRIC SCALES.

1598 P.	Set of 6 Paragon Scales, 30 cm. divided metric measure: .01 .02 .03 .05 .025 .0125	"	9 00
1599 P.	Set of 6 Paragon Scales, 50 cm. divided metric measure: .01 .02 .03 .05 .025 .0125	"	17 00

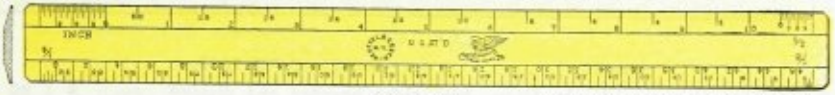
Sets of Scales with other divisions made to order.

For Boxwood Scales in Sets see page 186.

FINE QUALITY BOXWOOD SCALES.

Machine Divided, U. S. St'd.

DIVIDED: INCH TO THE FOOT.



No. 1391. "Copyright, 1887, by Keuffel & Esser."

DIVIDED: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, 1 INCH TO THE FOOT.

1390. Flat Boxwood Scale, 6 in. . . . . each $ 50
1391. do. 12 " . . . . . " 75
1392. do. 12½ " . . . . . " 85

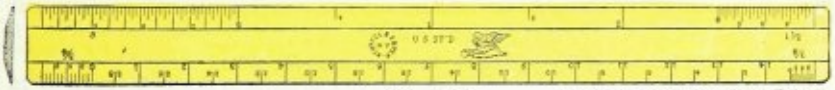
Scales No. 1392 and 1392R have the advantage of covering 100 feet on ⅛ inch, 50 feet on ¼ inch and 25 feet on ½ inch scale.

1393. Flat Boxwood Scale, 18 in. . . . . each 1 50
1394. do. 24 " . . . . . " 2 00
1395. do. 24 " div. $\frac{1}{2}$, $\frac{1}{4}$ inch to the foot and $\frac{1}{16}$ inch full size " 2 00



No. 1391 R.

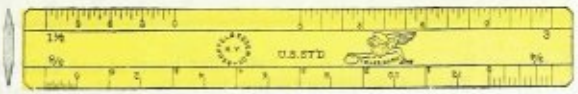
1391 R. Flat Boxwood Scale, 12 in., **bevels on opposite sides** . . . each $ 75
1392 R. do. 12½ in., " " " " . . . " 85



No. 1396. "Copyright, 1887, by Keuffel & Esser."

DIVIDED: $\frac{3}{4}$, $\frac{3}{2}$, 1½, 3 INCHES TO THE FOOT.

1396. Flat Boxwood Scale, 12 in. . . . . each $ 75
1397. do. 18 " . . . . . " 1 50
1398. do. 24 " . . . . . " 2 00
1396 R. do. 12 " **bevels on opposite sides** . . . . " 75



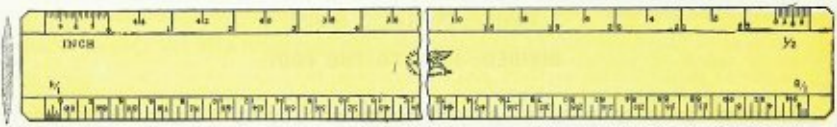
No. 1399.

1399. Flat Boxwood Pocket Scale, 6 in., **both sides beveled and divided**, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $1\times\frac{3}{8}$, $\frac{3}{4}$, 1½, 3 inches to the foot, in leather Sheath . . . . . each $ 1.85

Scale 1399 is less than one inch wide, and very convenient for the pocket. It has all the scales usually employed by the building professions.

Flat Boxwood scales with other divisions, one or **both sides divided**, made to order, see page 187.

FINE QUALITY BOXWOOD SCALES.

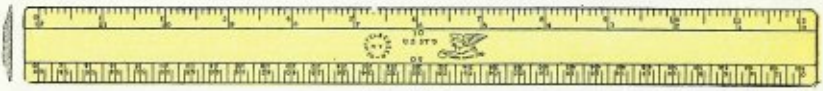


No. 1402. "Copyright, 1887, by Keuffel & Esser."

DIVIDED: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $1\times\frac{1}{2}$, $\frac{3}{4}$, $1\frac{1}{2}$, 1 INCHES TO THE FOOT.

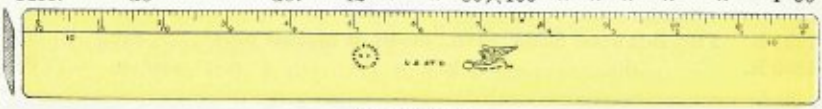
1400.	Flat Boxwood Scale, 12 in.,	**both sides beveled and divided,**								each	$ 1 20
1401.		do.	18	"	"	"	"	"	"	"	2 25
1402.		do.	24	"	"	"	"	"	"	"	3 00

DIVIDED: INCHES AND TENTHS.



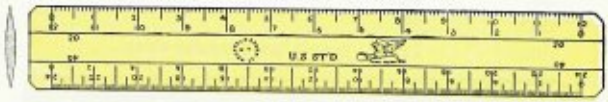
No. 1415. "Copyright, 1887, by Keuffel & Esser."

1410.	Flat Boxwood Chain Scale,	6 in.,	div.	10×50	parts to the inch,					each	$ 50
1411.	do.	do.	6	"	"	20×40	"	"	"	"	"	50
1412.	do.	do.	6	"	"	30×60	"	"	"	"	"	50
1413.	do.	do.	6	"	"	80×100	"	"	"	"	"	75
1415.	do.	do.	12	"	"	10×50	"	"	"	"	"	75
1416.	do.	do.	12	"	"	20×40	"	"	"	"	"	75
1417.	do.	do.	12	"	"	30×60	"	"	"	"	"	75
1418.	do	do.	12	"	"	80×100	"	"	"	"	"	1 00



No. 1415 R.

1415 R.	Flat Boxwood Chain Scales,	**bevels on opposite sides,**									
		12 in.	div.	10×50	parts to the inch,					each	$ 75
1416 R.	do.	12	"	"	20×40	"	"	"	"	"	75
1417 R.	do.	12	"	"	30×60	"	"	"	"	"	75
1418 R.	do.	12	"	"	80×100	"	"	"	"	"	1 00



No. 1419

1419. Flat Boxwood Pocket Scale, 6 in., **both sides beveled and divided,** div. 10, 40, 30 and 50 parts to the inch, in leather Sheath each . . . . . $ 85

Scale 1419 is less than one inch wide and very convenient for the pocket.

"Copyright, 1887, by Keuffel & Esser."



No. 1420.

1420.	Flat Boxwood Offset Scale,	2 in.,	div.	10×50	parts to the inch,					each	$ 50
1421.	do.	do.	2	"	"	20×40	"	"	"	"	"	50
1422.	do.	do.	2	"	"	30×60	"	"	"	"	"	50
1423.	do.	do.	2	"	"	80×100	"	"	"	"	"	75

Flat Boxwood Scales with other divisions, one or **both sides divided**, made to order, see page 187.

FINE QUALITY BOXWOOD SCALES.



No. 1426.

DIVIDED: FEET IN HUNDREDTHS.

1425.	Flat Boxwood Chain Scale.		12	in.,	div.	100×500	parts	to	the	foot,	each $	80
1426.	do.	do.	12	"	"	200×400	"	"	"	"	"	80
1427.	do.	do.	12	"	"	300×600	"	"	"	"	"	80
1428.	do.	do.	12	"	"	800×1000	"	"	"	"	"	1 10

MISCELLANEOUS DIVISIONS.

1450.	Flat Boxwood Chain Scale,		12	in.,	div.	10×12	parts	to	the	inch,	each $	75
1451.	do.	do.	12	"	"	10×16	"	"	"	"	"	75
1452.	do.	do.	12	"	"	12×16	"	"	"	"	"	75
1453.	do.	do.	12	"	"	16×32	"	"	"	"	"	75
1454.	do.	do.	12	"	"	32×64	"	"	"	"	"	75
1480.	do.	do.	6	"	"	16ths in. × mm.					"	50
1481.	do.	do.	12	"	"	"	"	"			"	75

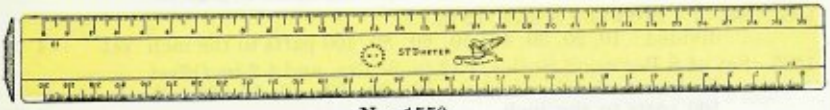


No. 1490 R.

1490R. Flat Boxwood Scale, 12 in., div. Proportional Inches, **bevels on opposite sides** . . . . . each $ 75

This Scale is designed especially for the use of Mechanical and Machine Draftsmen. It contains the Scales most used in practice: full, ½, ¼ and ⅛ size in inches, two scales on each edge, with the unit beyond the zero point subdivided.

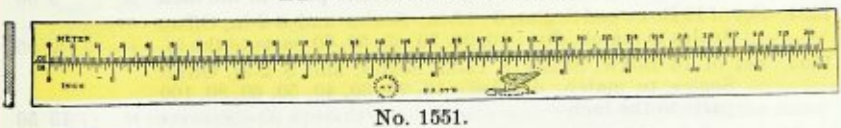
DIVIDED: METRIC MEASURE.



No. 1550.

1530.	Flat Boxwood Scale,	10	cm.	div.	mm.	and	half-mm.	. . .	each $	50
1540.	do.	20	"	"	"	"	"	. . .	"	60
1550.	do.	30	"	"	"	"	"	. . .	"	75
1560.	do.	50	"	"	"	"	"	. . .	"	1 50

METRIC COMPARING SCALE.

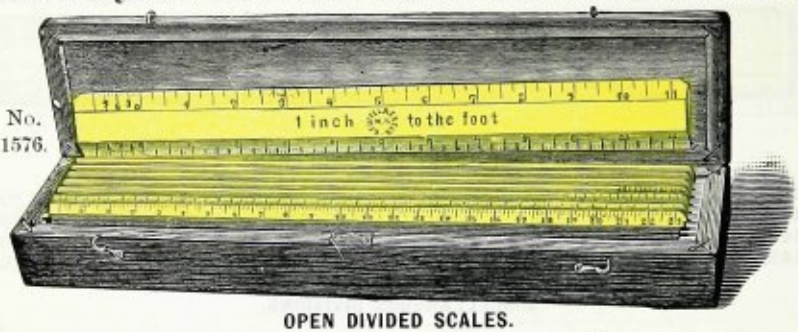


No. 1551.

1551.	Flat Boxwood Scale, 30 cm., div. half-mm. and sixteenths inches **on median line** (inch and meter comparing scale), not beveled. .	each $	90
1561.	do.	like No. 1551, but 50 cm.	"	1 80

For Flat Paragon Scales see page 178.
For Scales in Sets see pages 182 and 186.

FINE QUALITY BOXWOOD SCALES IN SETS.



No. 1576.

OPEN DIVIDED SCALES.

Each Scale has the same division on both edges, one edge reading from left to right, other edge from right to left. See figure C, page 187.

1575. Set of 4 Boxwood Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot . . . . . set $4 25

1576. Set of 8 Boxwood Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot . " 7 50

1577. Set of 12 Boxwood Scales, 12 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 inches to the foot, and $\frac{1}{16}$ inch full size . . . . . " 11 00

1578. Set of 4 Boxwood Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot . . . . . " 7 75

1579. Set of 8 Boxwood Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 inches to the foot . " 14 25

1580. Set of 12 Boxwood Scales, 18 in. divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4, 6 inches to the foot, and $\frac{1}{16}$ inch full size . . . . . " 21 00

CHAIN SCALES.

Each Scale has two different divisions one on each edge, each of which is numbered to read both ways. See figure D, page 188.

1584. Set of 4 Boxwood Scales, 12 in. divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch set 4 70

1585. Set of 8 Boxwood Scales, 4 12-in. Scales, and 4 2-in. Offset Scales to match, divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch . . . . . " 7 25

Each Scale has only one division, the same on both edges, and is numbered to read both ways on each edge.

1592. Set of 6 Boxwood Scales, 12 in. divided: 10, 20, 30, 40, 50, 60 parts to the inch . . . set 6 00

1593. Set of 8 Boxwood Scales, 12 in. divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch " 9 00

1594. Set of 12 Boxwood Scales, 6 12-in. Scales and 6 2-in. Offset Scales to match, div.: 10, 20, 30, 40, 50, 60 parts to the in. " 9 25

1595. Set of 16 Boxw. Scales, 8 12-in. Scales, and 8 2-in. Offset Scales to match, divided: 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch . . . . . " 15 50

METRIC SCALES.

1598. Set of 6 Boxwood Scales, 30 cm. divided: metric measure .01, .02, .03, .05, .025, .0125 " 6 00

1599. Set of 6 Boxwood Scales, 50 cm. divided: metric measure .01, .02, .03, .05, .025, .0125 " 11 00

For Paragon Scales in Sets see page 182.

Sets of Scales with other divisions made to order.

DIRECTIONS
FOR ORDERING SPECIAL SCALES.

We are frequently called upon to make Special Scales to order. To avoid error and tedious and delaying correspondence we give directions for ordering such Scales.

We furnish printed forms (schedules) for describing special scales to be made to order. We urgently recommend the use of these printed forms, which we send on request.

There are two distinctly different ways of dividing a scale:
the "**open divided**" and the "**full divided or Chain Scale.**"

OPEN DIVIDED SCALES

are illustrated under *A*, *B*, *C*. They are generally used in **architectural** or **mechanical** drawing, and are divided in inches or parts of inches, which represent feet or full inches. The units are marked along the whole length of the edge and only the end units are subdivided to inches and fractions.

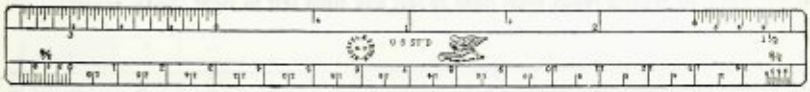


Fig. *A*. "Copyright, 1887, by Keuffel & Esser."

Fig. *A* represents an open divided Scale with **four different divisions,** two on each edge. Two of these divisions are numbered to read from the right, the other two from the left. (When two divisions are to be placed on one edge, one must be the double of the other like $\frac{1}{8} \times \frac{1}{4}$, $\frac{3}{8} \times \frac{3}{4}$, 2×4, etc.)

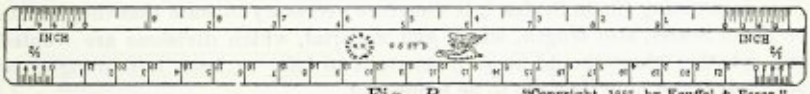


Fig. *B*. "Copyright, 1887, by Keuffel & Esser."

Fig. *B* represents an open divided Scale with **two different divisions,** one on each edge; each edge reading from right to left and from left to right.

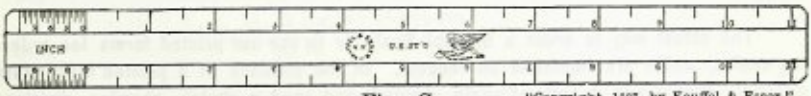


Fig. *C*. "Copyright, 1887, by Keuffel & Esser."

Fig. *C* represents an open divided Scale with only **one division,** the same on both edges; one edge reads from right to left, the other from left to right.

In ordering open divided Scales it is therefore necessary to state that they are to be open divided, also length, shape and material, how many different

divisions are wanted, which on each edge and whether the numbers should read from right to left, or from left to right or both ways. Of course they can read both ways only when there is but one division on each edge. If other than the usual numbering is wanted, this must also be explained in the order.

FULL DIVIDED OR CHAIN SCALES

are those on which equal divisions and sub-divisions are carried along the whole length of the graduations. Therefore only one kind of division can be made on one edge. They are generally divided to decimals of inches or feet, numbered continuous per 10 divisions, and are used by **Surveyors** and **Civil Engineers**, but they can be divided inches to the foot, as shown in figure *E*.

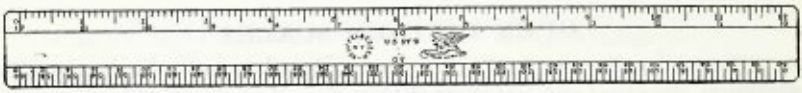


Fig. *D*. "Copyright, 1887, by Keuffel & Esser."

Fig. *D* represents a Chain Scale, with **two different divisions**, one on each edge, each of which **reads from right to left and from left to right** (both ways).



Fig. *E*. "Copyright, 1887, by Keuffel & Esser."

Fig. *E* represents a Chain Scale, with **two different divisions**, one on each edge, each of which reads from **left to right.**

In ordering Chain Scales it is therefore necessary to state that they are to be Chain Scales, also length, shape and material, which divisions are wanted and whether they should read from right to left, or from left to right, or both ways, and how they are to be numbered.

The price of special scales to order depends on so many factors, that it is not feasible to give any directions for estimating their cost. We shall be pleased to quote a price on receipt of an accurate description of the scale wanted.

The safest way to order a Special Scale is to use our printed forms for ordering scales, which are furnished on request. In the absence of a printed form, state material, shape and length of scale wanted and send a sketch showing divisions and numbering. It is not necessary that the sketch should show correct or actual divisions, if the value of the divisions (in inches, etc.) is stated.

See note on preceding page, about forms for ordering scales.

Scales with any divisions, also in foreign measures, made to order.

IVORY AND BOXWOOD SCALES.



"Copyright, 1887, by Keuffel & Esser."

1600. Flat Ivory Universal Scale, 12 in., hand divided,
one side $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, $\frac{5}{16}$, $\frac{5}{8}$, $\frac{7}{8}$, $1\frac{1}{4}$, $1\frac{3}{4}$ } inches to the foot, each $ 4 00
other " $\frac{3}{16}$, $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, 3 }
1601. Flat Boxwood Universal Scale, 12 in., hand divided, like 1600 " 75

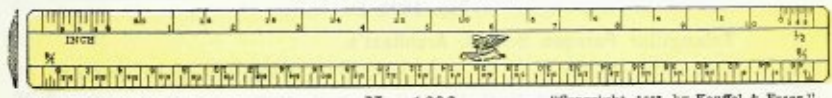


"Copyright, 1887, by Keuffel & Esser."

1602. Flat Ivory Universal Scale, 12 in., hand divided, all scales brought to the edge: one side $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, $2\times\frac{1}{16}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$ (inches to the foot), each $ 4 00
other " $\frac{5}{8}$, $1\frac{1}{4}$, $2\frac{1}{2}\times\frac{7}{8}$, $1\frac{3}{4}$, 3
1603. Flat Boxwood Universal Scale, 12 in., hand divided, like 1602 " 75

PLAIN FLAT BOXWOOD SCALES,

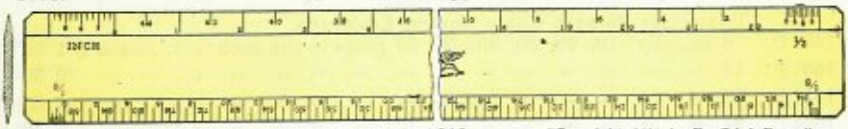
MACHINE DIVIDED.



No. 1606. "Copyright, 1887, by Keuffel & Esser."

Divided: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 inch to the foot:

1605. Flat Boxwood Scale, 6 in. . . . . each $ 30
1606. do. 12 " . . . . . " 50
1606½. do. 18 " . . . . . " 90
1607. do. 24 " . . . . . " 1 20
1608. do. 12 " divided $\frac{1}{16}$ inches on both edges " 50



No. 1610. "Copyright, 1887, by Keuffel & Esser."

1609. Flat Boxwood Scale, 12 in., **both sides beveled and divided,**
$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1 × $\frac{3}{8}$, $\frac{3}{4}$, $1\frac{1}{2}$, 3 inches to the foot . . . . . each $ 90
1609½. do. 18 in. . . . . " 1 50
1610. do. 24 " . . . . . " 2 00

No. 1615.

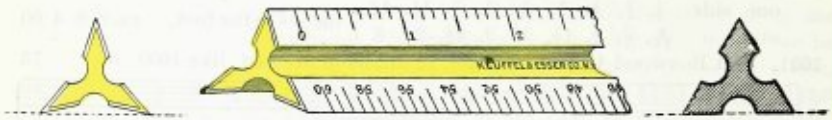


1615. Ivory Plotting Scale, 6 in. . . . . each $ 85
1616. Hardwood Plotting Scale, 6 in. . . . . " 15

TRIANGULAR SCALES.

MACHINE DIVIDED. U. S. ST'D.

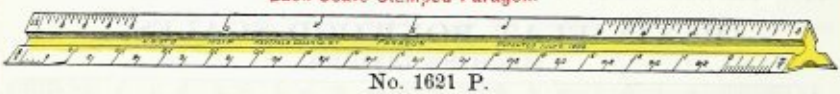
TRIANGULAR PARAGON SCALES.



Improved shape. Usual shape.

The Paragon Scales have the improved shape, shown in above cut, which prevents the divisions wearing off by friction and insures better contact with the drawing and a better angle of vision. The bevels bearing the divisions are lined with a material resembling ivory, like the Flat Paragon Scales.

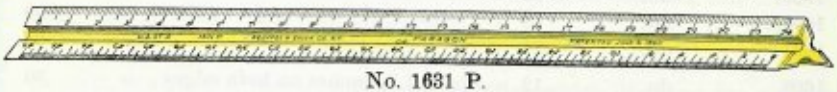
Each Scale Stamped Paragon.



No. 1621 P.

Triangular **Paragon** Scales, **Architect's.**

1620 P.	6 in., div. $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in., each	$1 50
1621 P.	12 " " " " " " " " " " " " " " " " " "	2 50
1622 P.	12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " "	2 50
1623 P.	18 " " " " " " " " " " " " " " " " " "	4 50
1624 P.	24 " " " " " " " " " " " " " " " " " "	6 50



No. 1631 P.

Triangular **Paragon** Chain Scales, **Engineer's,**

1630 P.	6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . . each	$ 1 50
1631 P.	12 " " " " " " " " " " " " . . . "	2 50
1632 P.	18 " " " " " " " " " " " " . . . "	4 50
1633 P.	24 " " " " " " " " " " " " . . . "	6 50
1634 P.	12 " " 20, 30, 40, 50, 60, 80 " " " " . . . "	2 50

1635 P. Triangular **Paragon** Chain Scale,
12 in. div. 100, 200, 300, 400, 500, 600 parts to the foot . 2 75

SHEATHS FOR TRIANGULAR SCALES.

In ordering, please state whether for Paragon, White Edge, Plain Boxwood, or Improved (B) Scale.

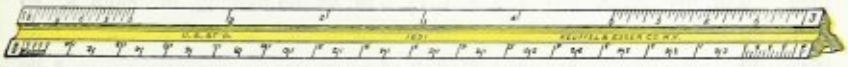
1619 A.	Sheaths for 6 in. scale . . . . . each	$	20
1619 B.	do. 12 " " . . . . . "		25
1619 C.	do. 18 " " . . . . . "		40
1619 D.	do. 24 " " . . . . . "		50

These sheaths are of stout cardboard, lined with velvet.

TRIANGULAR BOXWOOD SCALES

WITH WHITE EDGES.

MACHINE DIVIDED U. S. ST'D.



No. 1621W.

Triangular Boxwood Scales, white edges, **Architect's,**

1620W.	6 in., div. $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$ in.,	each	$1 25
1621W.	12 "		2 25
1622W.	12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " " "		2 25
1623W.	18 "		4 00
1624W.	24 "		6 00



No. 1631 W.

Triangular Boxwood Chain Scales, white edges, **Engineer's,**

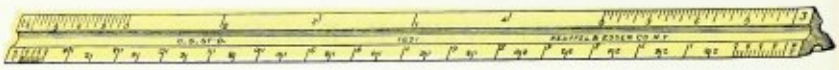
1630W.	6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . .	each	$ 1 25
1631W.	12 " " " " " " " " " " " " " " " " " "		2 25
1632W.	18 " " " " " " " " " " " " " " " " " "		4 00
1633W.	24 " " " " " " " " " " " " " " " " " "		6 00
1634W.	12 " " 20, 30, 40, 50, 60, 80 " " " " " "		2 25

Triangular Scales of any style, with any divisions, also in foreign measures, made to order.

For Sheaths for Scales see opposite page.

TRIANGULAR BOXWOOD SCALES.

MACHINE DIVIDED U. S. ST'D.



No. 1621.

Triangular Boxwood Scales, Architect's,

1620.	6 in. div. $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 3 in. to the foot, $\frac{1}{16}$, in., each	$ 60
1621.	12 "	1 00
1622.	12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, 3, 4 " " " " " " " "	1 00
1623.	18 "	2 50
1624.	24 "	4 25



No. 1631.

Triangular Boxwood Chain Scales, Engineer's,

1630.	6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . . . each	$ 60
1631.	12 "	1 00
1632.	18 "	2 50
1633.	24 "	4 25
1634.	12 " " 20, 30, 40, 50, 60, 80 " " " " " " " " " "	1 25
1635.	Triangular Boxwood Chain Scale, 12 in., div. 100, 200, 300, 400, 500, 600 parts to the foot "	1 50
1636.	Triangular Boxwood Offset Scale, 2 in., to match No. 1630 to 1633 . . . . . "	60
1638.	Triangular Boxwood Combination Scale, 12 in. (copyrighted by Prof. L. F. Rondinella), 1 face (flat) div.: full, $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$ size (proportional inches), 1 face (grooved) $\frac{3}{4}$, $\frac{3}{8}$, $\frac{3}{16}$, $\frac{3}{32}$ inches to the foot, 1 face (grooved) 10x50 parts to the inch . . . . . "	1 25

Triangular Scales of any style with any divisions, also in foreign measures, made to order.

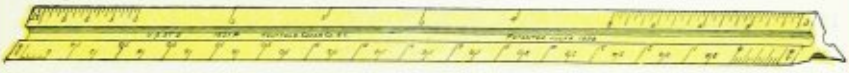
For Sheaths for Scales see page 190.

IMPROVED
TRIANGULAR BOXWOOD SCALES.

MACHINE DIVIDED U. S. ST'D.



The shape of these Triangular Scales prevents the wearing of the surface from contact with the drawing while using the scale, and it affords a better angle of vision than the usual shape.



No 1621 B.

Improved Triangular Boxwood Scales, **Architect's,**

1620 B. 6 in., div. $\frac{3}{32}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1½, 3 inches to the foot, $\frac{1}{16}$ in. each $ 75
1621 B. 12 " 1 25
1622 B. 12 " " $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1½, 2, 3, 4 " " " " " " " 1 25



No. 1631 B

Improved Triangular Boxwood Chain Scales, **Engineer's,**

1630 B. 6 in., div. 10, 20, 30, 40, 50, 60 parts to the inch . . . each 75
1631 B. 12 " 1 25
1634 B. 12 " " 20, 30, 40, 50, 60, 80 " " " " " " " " 1 50
1635 B. Improved Triangular Boxwood Chain Scale,
12 in. div. 100, 200, 300, 400, 500, 600 parts to the foot " 1 75

TRIANGULAR SCALES OF METAL.



No. 1640.

1640. Triangular Metal Scale, 12 in. nickelplated, **Architect's,**
divided like No. 1621, ... each $ 2 50
1641. do. do. do. 12 in. **Engineer's,** divided like No. 1631, " 2 50
1642. do. do. do. 12 in. " " " " 1634, " 2 50

METRIC TRIANGULAR SCALES. (Boxwood.)



No. 1655.

each
1645. Triangular Boxwood Scale, 20 cm., div. .01 .02 .03 .05 .025 .0125 $ 75
1655. do. 30 " " " " " " " " 1 00
1665. do. 50 " " " " " " " " 2 75

For Sheaths for Triangular Scales see page 190.

PAPER SCALES.

PRINTED ON BRISTOL BOARD FROM ENGINE DIVIDED PLATES.

19 × 1¾ inches.

(Each scale has only one division, except Nos. 1678, 1689.)



1675. Set A, 6 in Set, div. $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1½, 3 in. to the foot, set $ 1 00

1676. do. B, 6 " " " $\frac{3}{32}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{5}{16}$, $\frac{3}{8}$, $\frac{7}{8}$ " " " " " 1 00



1677. Set C, 6 in Set, div. 10, 20, 30, 40, 50, 60 parts to the in. set $ 1 00

1677 S. Separate Scales, any of the above . . . . . each 20

1677 T. Separate Scales, div. 2 in., 4 in. to the foot, 66 parts per inch, inches in 16ths. . . . " 20



No. 1678.

1678. Metric and Inch Comparing Scale, ½ meter long, divided 16ths inches and millimeters . . . . . each $ 30

1679. Metric Scale, ½ meter long, div. millimeters . . . . . " 20

1689. Scale of Proportional Inches, 12 in., div. $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{8}$ $\frac{1}{16}$ inches . " 10

PATENT SCALE GUARDS.



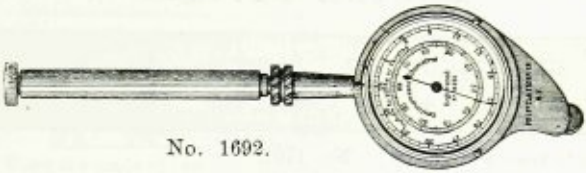
No. 1690.

1690. Patent Guards for Triangular Scales, German silver . . . each $ 20

1691. do. do. Nickel plated . . . . " 15

MAP MEASURES.

(CHARTOMETERS.)



No. 1692.

1692. Map Measure, 5 in., swiveling metal handle with lock-nut, dial with 2 graduations, Inches: Miles, and Centimeters: Kilometers . . . . . each $ 3 00

1694. Map Measure, watch pattern, 1½ in. diam., dial with 2 graduations: 12 inches in eighths and 25 feet . . . . . each $ 2 00

To measure a line, the instrument is set to 0, and the line is carefully followed in one direction by the small projecting tracer wheel holding the instrument vertical. The index hands on the dial will then indicate the length of the line in feet, inches and eighths inches.

Copyright, 1894, by Keuffel & Esser Co.

Illustration full size.



No. 1694.

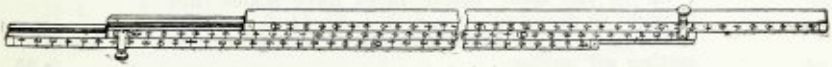
EXTENSION MEASURES.

These measures are of hardwood with brass mountings and the sections are tongued and grooved. Those in two sections (No. 1696) read opposite the end of the first section for all measurements beyond the first section; in those in three sections the reading is carried from the first to the third section and readings beyond the first and third sections are taken on the second (middle) section. They are all graduated in feet, inches and eighths of inches. They are useful in measuring between fixed points (floor and ceiling, door or window frame posts, aisles, etc.) and also where the object is not accessible for measuring with a tape.



No. 1696. "Copyright, 1887, by Keuffel & Esser.

1696 A.	Extension Measure,	4	feet,	2	fold,	extending to	8	feet,	each	$ 3 50
1696 B.	do.	5	"	2	"	"	10	"	"	4 00
1696 C.	do.	6	"	2	"	"	12	"	"	5 00

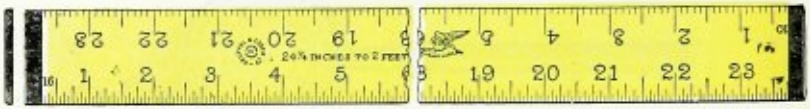


No. 1698. "Copyright, 1887, by Keuffel & Esser."

1698 D.	Extension Measure,	3	feet,	3	fold,	extending to	9	feet,	each	$ 5 00
1698 E.	do.	4	"	3	"	"	12	"	"	6 00
1698 F.	do.	5	"	3	"	"	15	"	"	7 50

SHRINKAGE RULES

ENGINE DIVIDED



"Copyright, 1894, by Keuffel & Esser Co."

No. 1701.

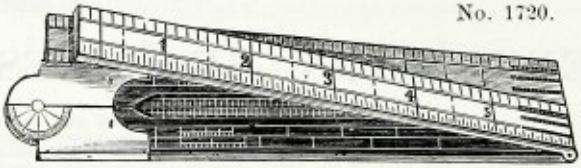
These Shrinkage Rules are of hardwood, brass tipped, both sides divided, about $1\frac{5}{16}$ in. wide by $\frac{1}{8}$ in. thick and divided to eights, tenths, twelfths and sixteenths inches. They are superior to all others in quality, accuracy and finish.

1700.	Shrinkage Rule,	$24\frac{2}{10}$	= 24 in.	(1 foot = 12.1 in.)	each	$	1 20
1701.	do.	$24\frac{1}{4}$	= 24 "	(1 " = $12\frac{1}{2}$ in.)	"		1 20
$1701\frac{1}{2}$.	do.	$24\frac{3}{8}$	= 24 "	(1 " = $12\frac{3}{16}$ in.)	"		1 20
1702.	do.	$24\frac{1}{2}$	= 24 "	(1 " = $12\frac{1}{4}$ in.)	"		1 20
1703.	do.	25	= 24 "	(1 " = $12\frac{1}{2}$ in.)	"		1 20
1704.	do.	$25\frac{1}{2}$	= 24 "	(1 " = $12\frac{3}{4}$ in.)	"		1 20
1705.	do.	26	= 24 "	(1 " = 13 in.)	"		1 20
1706.	do.	$26\frac{3}{4}$	= 24 "	(1 " = $13\frac{3}{8}$ in.)	"		1 20

Rules for any other shrinkage made to order. Prices on application.

SCALE RULES.

No. 1720.



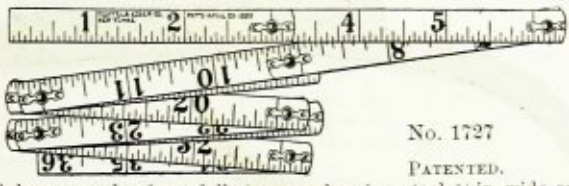
1720. Ivory Joint Rule, 2 feet, 4 fold, German silver mounted, 24 in. to $\frac{1}{8}$ first 6 in. to $\frac{1}{16}$, 12 in. to $\frac{1}{10}$, 12 in. to $\frac{1}{12}$, edge divided: foot to $\frac{1}{100}$. The inside edges are beveled and have Scales of $\frac{1}{16}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, inches to the foot; inside faces have scales (not brought to edge) of $\frac{3}{8}$, $\frac{7}{8}$, $1\frac{1}{4}$, $1\frac{1}{2}$ inches to the foot. The main joint is graduated to 5 degrees, for setting off angles . . . . . each $ 8 00

1721. Boxwood Joint Rule, 2 feet, 4 fold, German silver mounted, 24 in., to $\frac{1}{8}$, first 5 in. to $\frac{1}{16}$, 12 in. to $\frac{1}{10}$, 12 in. to $\frac{1}{12}$, edge divided: foot to $\frac{1}{100}$. The inside edges are beveled and have scales of $\frac{1}{16}$, $\frac{3}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 in. to the foot: inside faces have scales (not brought to the edge) of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{5}{8}$, $\frac{7}{8}$, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, 3 inches to the foot. Main joint graduated to 5 degrees, for setting off angles . . . . . " 2 25

1722. Boxwood Joint Rule, 2 feet, 4 fold, Brass mounted, 24 in., divided to $\frac{1}{8}$, 12 in. to $\frac{1}{12}$, 12 in. to $\frac{1}{10}$, 24 in. to $\frac{1}{16}$, scales on beveled edges of $\frac{1}{16}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch to the foot. The main joint is graduated at 45, 60 and 90 degrees. . . . . " 1 35

K & E PATENT FOLDING POCKET RULES

SPRING JOINT STEEL RULES.



No. 1727

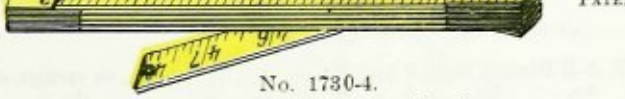
PATENTED.

These Rules are made of carefully tempered spring steel, ⅜ in. wide and graduated on both sides. They fold up smaller than any other rule, the 12-fold three-foot rule is only ¾ in. thick × 3¾ in. long when folded.

The divisions are sharp and accurate and the numbering is very distinct. It runs in opposite directions on the two sides. The aligning springs at the joints hold the rule in a rigid straight line when it is opened, without in any way interferring with folding it.

1725.	K & E Steel Pocket Rule	1 foot,	4 fold	div.	$\frac{1}{16} \times \frac{1}{16}$ in.	each	$	25
1726.	do.	do.	2 "	8 "	"	do.	"	"		50
1727.	do.	do.	3 "	12 "	"	do.	"	"		75
1725 D.	do.	do.	1 "	4 "	"	$\frac{1}{16}$ in. × $\frac{1}{100}$ ft.	"		40
1726 D.	do.	do.	2 "	8 "	"	do.	"	"		70
1727 D.	do.	do.	3 "	12 "	"	do.	"	"	1	00
1728.	do.	do.	3 "	12 "	"	$\frac{1}{16}$ in. × mm.	"	1	00
	Leather Sheaths for above rules						"			05

SPRING JOINTS, HARDWOOD, YELLOW FINISH; 5/8 IN. WIDE.



PATENTED

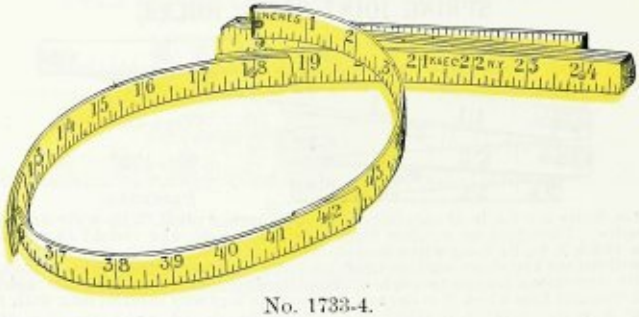
No. 1730-4.

1730-2.	K & E Pocket Rule,	2 feet,	4 fold,	div.	$\frac{1}{16} \times \frac{1}{16}$ in.,	metal tips,	each	$	25
1730-3.	do.	do.	3 "	6 "	"	do.	"	"	"	"	35
1730-4.	do.	do.	4 "	8 "	"	do.	"	"	"	"	50
1730-5.	do.	do.	5 "	10 "	"	do.	"	"	"	"	60
1730-6.	do.	do.	6 "	12 "	"	do.	"	"	"	"	75
1730-8.	do.	do.	8 "	16 "	"	do.	"	"	"	"	1	00
1730-4 F.	K & E Pocket Rule,	numbered feet and inches,										
		4 feet,	8 fold,	div.	$\frac{1}{16}$ in. × $\frac{1}{16}$ in.,	"	"	"	50
1730-5 F.	do.	do.	5 "	10 "	do.	"	"	"	60
1730-6 F.	do.	do.	6 "	12 "	do.	"	"	"	75
1730-8 F.	do.	do.	8 "	16 "	do.	"	"	"	1	00
1730-4D.	K & E Pocket Rule,	4 feet,	8 fold,	div.	$\frac{1}{16}$ in. × $\frac{1}{100}$ ft.,	"	"	50
1730-6D.	do.	do.	6 "	12 "	do.	"	"	"	75
1732-4.	do.	do.	4 "	8 "	"	$\frac{1}{16}$ in. × mm.,	"	"	"	50
1730 SP.	do.	do.	4 "	8 "	"	$\frac{1}{16} \times \frac{1}{16}$ in.,				
	with scales and tables						"	"	"	75

Nos. 1730 to 1730 SP. are provided with ingenious spring joints, which hold the rule in a straight line when open, so that vertical or horizontal distances may be easily measured. The ends are provided with **metal tips** (see note, page 199).

Rule 1730 SP. is divided on both sides like No. 1730-4. In addition it has scales of ½, ¼, ⅛, 1/16 inch to the foot and a useful table of 22 of the most frequently used ratios and specific gravities.

PLAIN JOINTS, HARDWOOD, YELLOW FINISH; 5/8 in. WIDE.



No. 1733-4.

no springs, metal tips.

1733-2.	K & E Pocket Rule,	2	feet,	4	fold,	div.	$\frac{1}{16}\times\frac{1}{16}$	in ,	extra flexible,	each	$	30
1733-3.	do.	do.	3	"	6	"	do.	"	"	"	"	30
1733-4.	do.	do.	4	"	8	"	do.	"	"	"	"	40

Rules No. 1733 are very thin and flexible, so that curves and circumferences as small as 5 in. diameter, may be easily measured with them. They have no springs.



No. 1734-3

1734-3.	K & E Pocket Rule,	3	feet,	6	fold,	div.	$\frac{1}{16}\times\frac{1}{16}$	in.,	**no springs,**	each	$	18
1734-4.	do.	do.	4	"	8	"	"	"	"	do.	"	25
1735-2.	do.	do.	2	"	6	"	"	"	"	do.	"	15
1735-3.	do.	do.	3	"	9	"	"	"	"	do.	"	25

SPRING JOINTS, HARDWOOD, YELLOW FINISH; 3/8 in. WIDE.

NARROW.

Illustration ½ size



No. 1736-2

1736-2.	K & E Pocket Rule,	2	feet,	6	fold,	$\frac{1}{16}\times\frac{1}{16}$	in.,	**metal tips,**	each	$	30
1736-3.	do.	do.	3	"	9	"	do.	"	"	"	45
1737-2.	do.	do.	2	"	6	"					
			$\frac{1}{10}$ and $\frac{1}{100}$ feet on both sides,						"	"	"	30

No. 1736-2 to 1737-2 are made like numbers 1730-2, etc., but are in 4-inch joints and only ¾ in. wide. The 3 foot rule, when closed, measures only ¾ x ⅝ x 5 inches. These miniature rules are therefore very convenient for the pocket. They are just as accurate as the larger rules.

For Ivorine (White) Pocket Rules see opposite page.

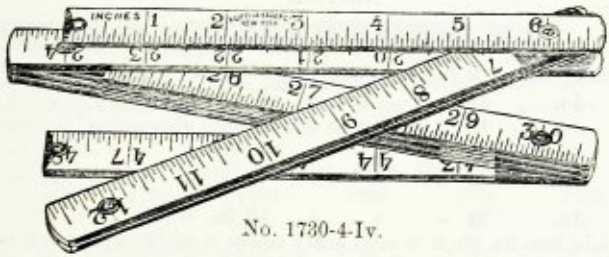
K & E
IVORINE FOLDING RULES.

PATENTED.

Ivorine Pocket Rules are similar to the celebrated K & E Folding Pocket Rules, but have a white coating on which the black graduations and figures are much more distinct and legible than on the yellow rules. This coating is very durable and permanent, resists heat and moisture and can be cleaned with water, alcohol or oil, so that the nice appearance and distinctness of the rule can be preserved.

The ends of the rule are protected against wear by metal tips of a very practical patented device. They do not obscure the graduations and are securely fastened in place without rivets and flush with the rule. They preserve the correctness of the rule.

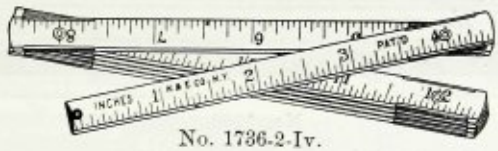
SPRING JOINTS, HARDWOOD, IVORINE FINISH; 5/8 IN. WIDE.



No. 1730-4-Iv.

1730-2-Iv.	Ivorine Pocket Rule, 2 ft., 4 fold, div. $\frac{1}{16}\times\frac{1}{16}$ in.,								metal tips,				each $	40
1730-3-Iv.	do.	do.	do.	3	"	6	"	"	do.	"	"	"	"	50
1730-4-Iv.	do.	do.	do.	4	"	8	"	"	do.	"	"	"	"	60
1730-5-Iv.	do.	do.	do.	5	"	10	"	"	do.	"	"	"	"	75
1730-6-Iv.	do.	do.	do.	6	"	12	"	"	do.	"	"	"	"	90
1730-8-Iv.	do.	do.	do.	8	"	16	"	"	do.	"	"	"	"	1 20
1730-4-D-Iv.	do.	do.	do.	4	"	8	"	"	$\frac{1}{16}$ in. $\times\frac{1}{100}$ ft	"	"	"		75
1730-6-D-Iv.	do.	do.	do	6	"	12	"	"	do.	"	"	"		1 15
1730-4-M-Iv.	do.	do.	do.	4	"	8	"	"	$\frac{1}{16}$ in. $\times$ mm.	"	"	"		60

SPRING JOINTS HARDWOOD, IVORINE FINISH; 3/8 IN. WIDE. NARROW.



No. 1736-2-Iv.

1736-2-Iv.	Iyorine Pocket Rule, 2 ft., 6 fold, div. $\frac{1}{16}\times\frac{1}{16}$ in.,								metal tips,				each $	50
1736-3-Iv.	do.	do.	do.	3	"	9	"	"	do.	"	"	"	"	60
1737-2-Iv.	do.	do.	do.	2	"	6	"	"	$\frac{1}{100}$ ft. $\times\frac{1}{100}$ ft.	"	"	"		50
1737-M-Iv.	do.	do.	do.	1 meter, 10 fold div. $\frac{1}{16}$ in. $\times$ mm.						"	"	"		75

ROLLING PARALLEL RULES.

FINEST QUALITY.

MANUFACTURED BY

KEUFFEL & ESSER CO.

Our Metal Rolling Parallel Rules are constructed to insure the greatest possible accuracy of motion and are also much heavier than those generally offered. The metal guard over the axle is so shaped that it forms a convenient handle.



No. 1751.

GERMAN SILVER.

1750.	Parallel Rule,	9 in.,	weight about 24 oz.,	in plain box . each	$ 8 50
1751.	do.	12 "	" " 32 "	" " " . "	10 00
1752.	do.	15 "	" " 40 "	" " " . "	12 00
1753.	do.	18 "	" " 54 "	" " " . "	15 00
1754.	do.	24 "	" " 72 "	" " " . "	20 00
1754 H.	do.	24 "	" " 10 lb.	" " " . "	35 00

Parallel Rule No. 1754 H is extra heavy (about ⅜ in. thick) and is recommended as the most reliable parallel rule for the most accurate work.

BRASS.

1755.	Parallel Rule,	9 in.,	weight about 24 oz.,	in plain box . each	$ 7 25
1756.	do.	12 "	" " 32 "	" " " . "	8 50
1757.	do.	15 "	" " 40 "	" " " . "	10 00
1758.	do.	18 "	" " 54 "	" " " . "	12 00
1759.	do.	24 "	" " 72 "	" " " . "	18 00

Mahogany Boxes for Nos. 1750 to 1759: 9 12 15 18 24 in.
each $ 1 00 1 10 1 25 1 35 1 50



No. 1760.

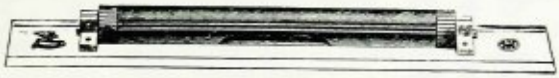
1760.	Ebony Rolling Parallel Rule, Brass mountings, white edges, div. ⅛, ¼, ½, 1 in. to the foot,			12 in.,	each $ 5 00
1761.	do.	do.	do.	15 "	" 6 50
1762.	do.	do.	do.	18 "	" 7 50

See Note about Ebony page 223.



No. 1766.

1765.	Ebony Rolling Parallel Rule,	Brass mountings,	9 in.	. .	each	$	2 75
1766.	do.	do.	"	12 "	. .	"	3 25
1767.	do.	do.	"	15 "	. .	"	4 00
1768.	do.	do.	"	18 "	. .	"	5 00



For Xylonite Parallel Rules, (transparent edges) see page 216.

FOLDING PARALLEL RULES.



No. 1781.

As the imported wooden Rules warp and shrink when brought into this climate, we have discontinued them and offer only those of our own make which we can recommend and warrant. (See note about Ebony, page 223).

KEUFFEL & ESSER Co's. Ebony Parallel Rules, Brass Bars,

	1780	1781	1782	1783	1784	1785
	6	9	12	15	18	24 in.
each	$ 50	70	90	1 10	1 50	2 25

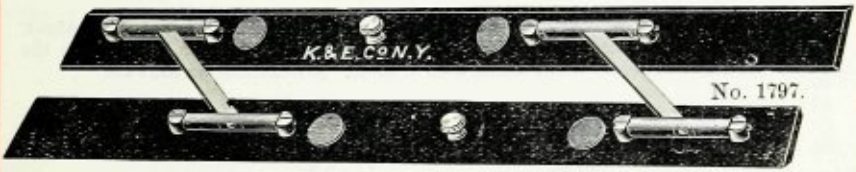
HARD RUBBER PARALLEL RULES.



No. 1921.

1920.	Hard Rubber Folding Parallel Rule,	nickelplated bars,	6 in.,	each	$	75
1921.	" " "	do.	"	9 "	"	1 00
1922.	" " "	do.	"	12 "	"	1 25
1923.	" " "	do.	"	15 "	"	1 50
1924.	" " "	do.	"	18 "	"	1 75
1925.	" " "	do.	"	24 "	"	2 50

SIGSBEE'S PATENT PARALLEL RULES.



No. 1797.

1796.	Sigsbee's Patent Parallel Rules,	15 in.,	Ebony	each	$	3 00
1797.	" " "	"	18 "	"	"	4 00
1798.	" " "	"	24 "	"	"	5 00

These Parallel Rules have nickelplated brass mountings and the bars are pivoted, so that the rule can be laid over, (stepping) to cover any distance.

See Note about Ebony, page 223

HARD RUBBER DRAWING TOOLS







To enable buyers to know that they are obtaining our hard rubber goods, we stamp each piece with our firm name and trade mark.



HARD RUBBER TRIANGLES.

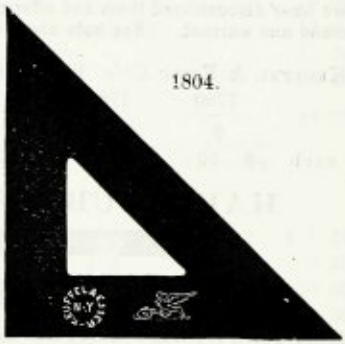
Copyright, 1897, by Keuffel & Esser.

8 in.

No. 1802.



1804.



1802. **Improved** Hard Rubber Triangles, 30 × 60 degrees,

	4	6	8	10	12	14	16 in.
each $	20	30	45	65	90	1 25	1 50

1804. **Improved** Hard Rubber Triangles, 45 degrees,

	4	6	8	10	12	14	16 in.
each $	25	45	65	95	1 30	1 85	2 50

The K & E Co. Improved Hard Rubber Triangles have bevels on their inner edges, from opposite faces (surfaces) so that they can be readily picked up by catching the finger nail under the bevel when taking hold of them. See description page 208.





For Xylonite, Steel, German Silver and Wood Triangles, see pages 208, 219, 223.

HARD RUBBER CURVES.



No. 1820.

1820. Hard Rubber Curves:

No. 1	each	$ 35	No. 8	each	$ 20	No. 15	each	$ 35	No. 22	each	$ 35
" 2	"	35	" 9	"	20	" 16	"	30	" 23	"	35
" 3	"	50	" 10	"	20	" 17	"	35	" 24	"	60
" 4	"	50	" 11	"	20	" 18	"	35	" 25	"	35
" 5	"	35	" 12	"	25	" 19	"	45	" 26	"	35
" 6	"	35	" 13	"	45	" 20	"	45	" 27	"	75
" 7	"	25	" 14	"	30	" 21	"	45	" 29	"	1 50

For Xylonite (transparent) Curves, see page 210.

For Pearwood Curves, see page 225.

KEUFFEL & ESSER CO. NEW YORK.

Illustrations about ½ size.



No. 1836.

HARD RUBBER SHIP CURVES.

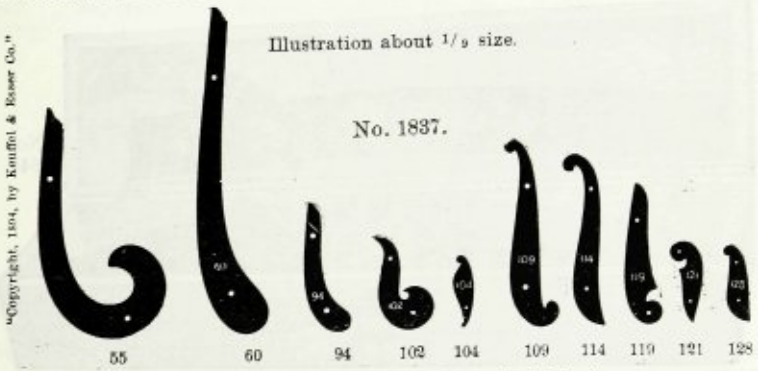
1836. Separate Hard Rubber Copenhagen Ship Curves. (See cuts opposite.)

No.	each	No.	each	No.	each	No.	each	No.	each
31	$ 1 00	56	$ 1 00	80	$ 40	104	$ 30	128	$ 30
32	1 00	57	60	81	40	105	35	129	40
33	1 00	58	60	82	40	106	40	130	40
34	1 00	59	60	83	40	107	40	131	40
35	1 00	60	50	84	40	108	40	132	40
36	1 00	61	60	85	40	109	50	133	40
37	1 00	62	60	86	40	110	60	134	40
38	1 00	63	60	87	50	111	40	135	40
39	1 00	64	60	88	60	112	50	136	35
40	1 00	65	60	89	60	113	40	137	30
41	1 00	66	40	90	50	114	35	138	40
42	1 00	67	40	91	50	115	40	139	40
43	1 00	68	40	92	40	116	40	140	40
44	1 00	69	40	93	40	117	35	141	40
45	1 00	70	40	94	35	118	25	142	40
46	1 00	71	40	95	40	119	35	143	35
47	1 00	72	40	96	40	120	35	144	40
48	80	73	40	97	40	121	30	145	40
49	60	74	40	98	50	122	30	146	40
50	60	75	40	99	40	123	25	147	40
51	60	76	40	100	40	124	25	148	40
52	50	77	40	101	40	125	25	149	40
53	50	78	40	102	30	126	25	150	40
54	80	79	40	103	35	127	25	151	40
55	50								

1836-S. Set of 121 Hard Rubber Copenhagen Ship Curves, Nos. 31 to 151, as listed under No. 1836, in Hardwood Case . . . . Set $ 56 00

For Xylonite (Transparent) Ship Curves see page 213.
" Pearwood Ship Curves " " 227.

CURVES FOR MECHANICAL ENGINEERS.



©Copyright, 1904, by Keuffel & Esser Co.

1837. Set of 10 Hard Rubber Curves for Mechanical Engineers, containing: No. 55, 60, 94, 102, 104, 109, 114, 119, 121, 128 of No. 1836, in wooden Box . . . . . set $ 3 75

For Xylonite (transparent) Curves, like No. 1837, see page 211.

KEUFFEL & ESSER CO'S. RAILROAD CURVES

AWARDED

THE ONLY MEDAL

AT THE NATIONAL EXPOSITION

OF

RAILWAY APPLIANCES

CHICAGO, 1883.

HARD RUBBER RAILROAD CURVES.

These curves are cut by special machinery and are true circular curves. They are the same on both edges, so that either edge can be used. Our curves will be found far more accurate than any others. Their edges have the same hand finish (not polish) as our other hard rubber tools.

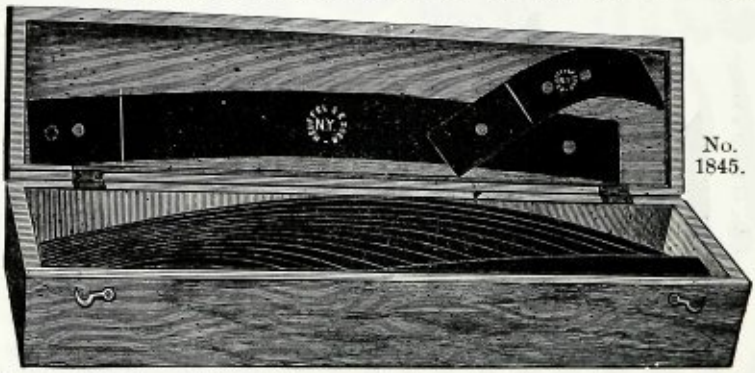
They are put up in handsome hardwood cases, those of sets 1842 to 1846 having partitions to prevent warping of the curves from mutual pressure while in the box. See description on page 217.



1840. Hard Rubber Railroad Curves, 10 in set, viz: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 in. radius, in wooden box . . set $ 7 75

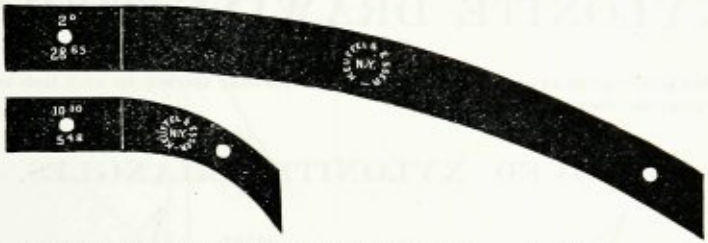
1841. Hard Rubber Railroad Curves, 17 in set, viz: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in. radius, in wooden box . . . . . " 13 25

1842. Hard Rubber Railroad Curves, 40 in set, viz: 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 66, 72, 78, 84, 90, 96, 102, 108, 114, 120 in. radius, 1 curve 1° to 100 foot scale 57.30 in., 1 curve 2° to 100 foot scale 28.65 in., in wooden box with Partitions . . . . . " 28 00



No. 1845.

1845. Hard Rubber Railroad Curves **with Tangent,** 55 in set, viz.: 3, 3½, 4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 32, 34, 35, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200 in. radius, in wooden box with Partitions. . . . . set $ 40 00



1846. Hard Rubber Railroad Curves, **with Tangent**, marked in degrees and inches to scale 100 feet = 1 inch, 41 in set, viz.:

0°.30′ = 114.59 in.	3°.30′ = 16.37 in.	6° = 9.55 in.	8°.30′ = 6.75 in.
1°. = 57.30 "	3°.45′ = 15.28 "	6°.15′ = 9.17 "	8°.45′ = 6.55 "
1°.15′ = 45.84 "	4° = 14.33 "	6°.30′ = 8.82 "	9° = 6.37 "
1°.30′ = 38.20 "	4°.15′ = 13.48 "	6°.45′ = 8.49 "	9°.15′ = 6.20 "
1°.45′ = 32.74 "	4°.30′ = 12.73 "	7° = 8.19 "	9°.30′ = 6.04 "
2° = 28.65 "	4°.45′ = 12.07 "	7°.15′ = 7.91 "	9°.45′ = 5.88 "
2°.15′ = 25.47 "	5° = 11.46 "	7°.30′ = 7.64 "	10° = 5.74 "
2°.30′ = 22.92 "	5°.15′ = 10.92 "	7°.45′ = 7.40 "	10°.30′ = 5.48 "
2°.45′ = 20.84 "	5°.30′ = 10.42 "	8° = 7.17 "	11° = 5.22 "
3° = 19.10 "	5°.45′ = 9.97 "	8°.15′ = 6.95 "	11°.30′ = 4.99 "
3°.15′ = 17.63 "			

in wooden Box with Partitions . . . . set $ 30 00

These Hard Rubber Railroad Curves are made to correct radii, to a scale of 1 inch = 100 feet, both edges having the same radius. Formula: radius = ½ chord ÷ sin. ½ angle = 50 ÷ sin ½ angle. The short tangents are very useful, as they enable correct locating of the beginning of the curve on the drawing by means of the radial line separating the tangent from the curve.

SEPARATE RAILROAD CURVES.

Railroad Curves as described above, to any desired scale, cut to order:

1847. Separate Hard Rubber Railroad Curves . . . . . each $ 75
1847T. do. do. do. with Tangent . " 90

CURVE RADIATOR.



No. 1848.

1848. Curve Radiator, Hard Rubber, 9 in. . . . . each $ 1 50

A convenient tool for erecting perpendiculars (radii, secants) on curves. It can be used from either the convex or the concave edge of the curve. The drawing edge of the arm gives the radius.



For Xylonite (transparent) Railroad Curves, see page 217.
For Pearwood and Cardboard Curves, see page 228.

XYLONITE DRAWING TOOLS.

(Transparent.)

The Xylonite which we use in manufacturing our goods, is made specially for such tools and stands better than the material generally used.

IMPROVED XYLONITE TRIANGLES.



THE OLD WAY.

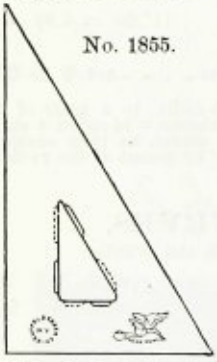


THE NEW WAY.

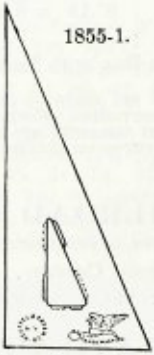
The K. & E. Co. Improved Xylonite Triangles have bevels on their inner edges from opposite faces (surfaces) so that they can be readily picked up by catching the finger nail under the bevel when taking hold of them.

Draftsmen who have experienced the great annoyance of blurring a fresh ink-line in trying to shift or remove a triangle, will readily appreciate this important although simple improvement.

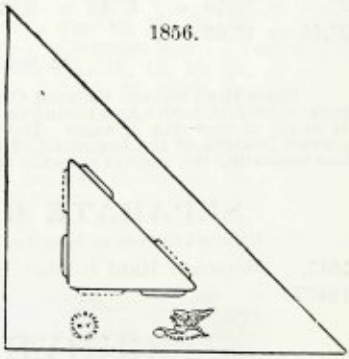
No. 1855.



1855-1.



1856.



1855. **Improved** Xylonite Triangles, 30 × 60 degrees,

	4	5	6	7	8	9	10	11	12	13	14	16 in.
each $	25	35	40	45	55	65	75	85	1 00	1 25	1 65	2 50

1855-1. **Improved** Xylonite Triangles, 22½ × 67½ degrees,

	4		6		8		10		12		14	16 in.
each $	25		40		55		75		1 00		1 65	2 50

1856. **Improved** Xylonite Triangles, 45 degrees,

	4	5	6	7	8	9	10	11	12	13	14	16 in.
each $	35	45	55	65	75	95	1 10	1 35	1 65	1 90	2 20	3 15

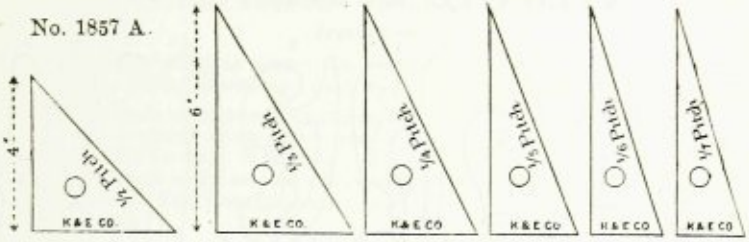


For Hard Rubber Triangles see page 202.

For Metal Triangles see page 219.

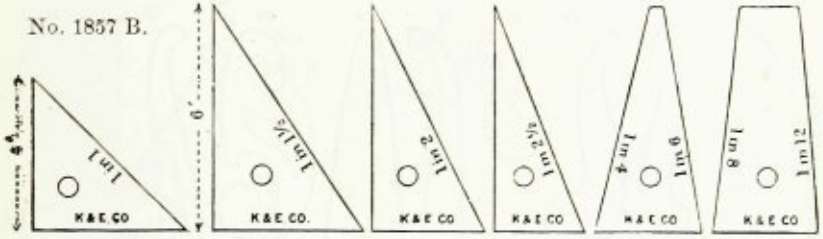
For Wood Triangles see page 223.

No. 1857 A.

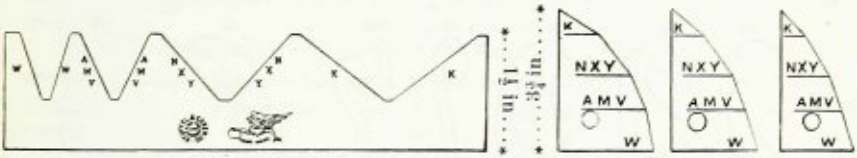


1857A. Xylonite Triangles for roof pitches, 6 in set . . . . . set $ 3 00

No. 1857 B.



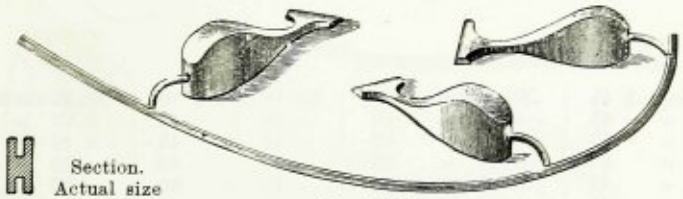
1857B. Xylonite Triangles for embankments, 8 slopes on 6 templets, set $ 4 50



No. 1858. No. 1859

1858. Xylonite Lettering Templets, 3 in set . . . . . set $ 2 00
1859. Xylonite Lettering Triangles, 3 in set . . . . . " 1 50

BLACK XYLONITE SPLINES.



Section.
Actual size

1859B. Black Xylonite Splines, No. 1859B.

	12	18	24	30	36	42	48 in.
each $	30	35	45	50	55	60	75

These Splines are grooved as shown in the section, to admit the finger of the weights which hold them in position.

For Spline Weights, Pearwood Splines and Sets of Splines see page 226.

XYLONITE CURVES. (Transparent.)

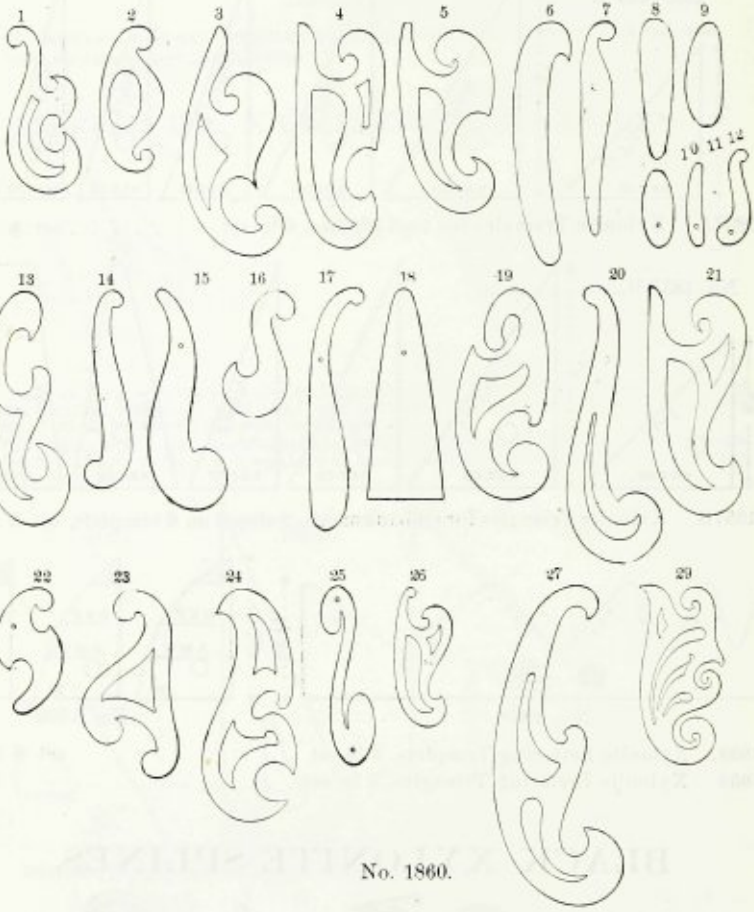


Illustration about ½ size.

No. 1860.

1860. Xylonite Curves, (Transparent)

No. 1 each	$ 45	No. 8 each	$ 30	No. 15 each	$ 50	No. 22 each	$ 45
" 2 "	45	" 9 "	30	" 16 "	45	" 23 "	45
" 3 "	60	" 10 "	25	" 17 "	45	" 24 "	75
" 4 "	60	" 11 "	25	" 18 "	45	" 25 "	45
" 5 "	45	" 12 "	40	" 19 "	60	" 26 "	45
" 6 "	45	" 13 "	60	" 20 "	60	" 27 "	90
" 7 "	40	" 14 "	45	" 21 "	50	" 29 "	1 80

For Hard Rubber Curves see page 203.

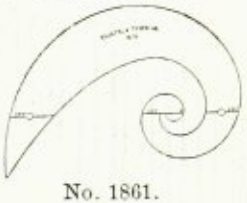
For Pearwood Curves see page 225.

LOGARITHMIC SPIRAL CURVE.

(Transparent.)

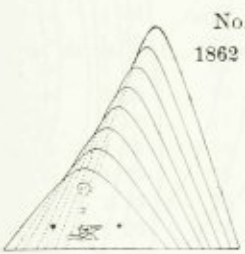
1861. Logarithmic Spiral Curve, Xylonite, 8 in., with Directions, each $ 1 75

This curve is constructed mathematically and contains every curve within the limit of its size. It is a tool of large scope and useful also for various calculations. Full Directions are furnished with it.



No. 1861.

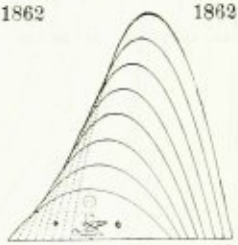
XYLONITE (Transparent) ELLIPSES, HYPERBOLAS, PARABOLAS.



No. 1862 B.



1862



1862 C.

1862. Xylonite Ellipses, set of 10, major axis, 1½ to 6 in. (by ½ in.) set $ 3 50

1862A. " " " 6, " " 2 " 4½ " " ½ " " 2 25

The ratio of the axis of Ellipses is 3 : 4. Both axes are marked correctly.

1862B. Xylonite Hyperbolas, set of 8, height 2 to 5½ in. (by ½ in.) set $ 2 75

1862C. " Parabolas " 8, " 1½ " 5⅝ " " ⅝ " " 2 75

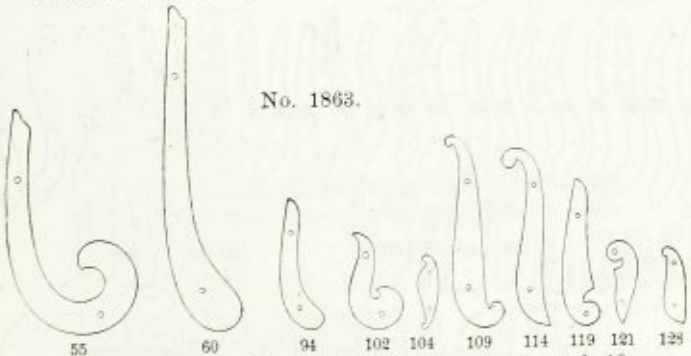
1862D. " " " 8, " 3½ " 14 " " 1½ " " 6 00

The Hyperbolas and Parabolas have 4 in. base.

For Pearwood Ellipses, Hyperbolas and Parabolas see page 226.

XYLONITE (Transparent) CURVES FOR MECHANICAL ENGINEERS.

No. 1863.



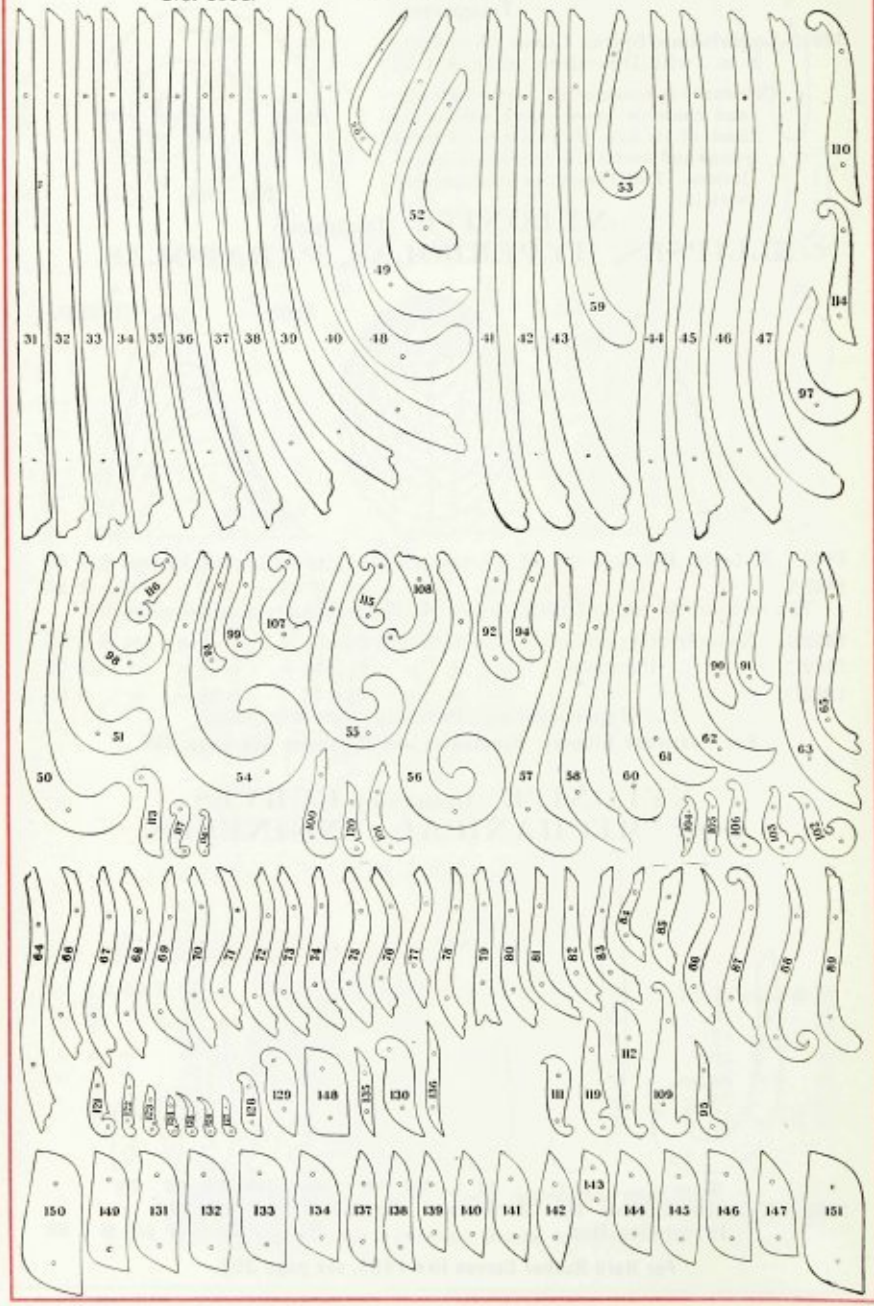
55 60 94 102 104 109 114 119 121 128

1863. Xylonite Curves for Mechanical Engineers, set of 10, in wooden Box . . . . . set $ 4 80

For Hard Rubber Curves like 1863, see page 205.

XYLONITE SHIP CURVES.

No. 1864. Illustration about ⅛ size.



XYLONITE SHIP CURVES

(Transparent)

1864. Separate Xylonite Copenhagen Ship Curves. (see cuts opposite)

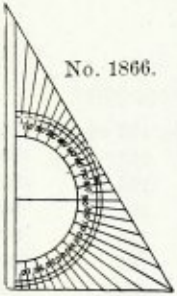
No.	31	each	$1 25	No.	62	each	$ 75	No.	92	each	$ 50	No.	122	each	$ 35
	32	"	1 25		63	"	75		93	"	50		123	"	30
	33	"	1 25		64	"	75		94	"	45		124	"	30
	34	"	1 25		65	"	75		95	"	50		125	"	30
	35	"	1 25		66	"	50		96	"	50		126	"	30
	36	"	1 25		67	"	50		97	"	50		127	"	30
	37	"	1 25		68	"	50		98	"	50		128	"	35
	38	"	1 25		69	"	50		99	"	50		129	"	50
	39	"	1 25		70	"	50		100	"	50		130	"	50
	40	"	1 25		71	"	50		101	"	50		131	"	50
	41	"	1 25		72	"	50		102	"	40		132	"	50
	42	"	1 25		73	"	50		103	"	50		133	"	50
	43	"	1 25		74	"	50		104	"	35		134	"	50
	44	"	1 25		75	"	50		105	"	45		135	"	50
	45	"	1 25		76	"	50		106	"	50		136	"	45
	46	"	1 25		77	"	50		107	"	50		137	"	35
	47	"	1 25		78	"	50		108	"	50		138	"	50
	48	"	1 00		79	"	50		109	"	65		139	"	50
	49	"	75		80	"	50		110	"	75		140	"	50
	50	"	75		81	"	50		111	"	50		141	"	50
	51	"	75		82	"	50		112	"	65		142	"	50
	52	"	65		83	"	50		113	"	50		143	"	45
	53	"	65		84	"	50		114	"	45		144	"	50
	54	"	1 00		85	"	50		115	"	50		145	"	50
	55	"	70		86	"	50		116	"	50		146	"	50
	56	"	1 25		87	"	65		117	"	45		147	"	50
	57	"	75		88	"	75		118	"	45		148	"	50
	58	"	75		89	"	75		119	"	45		149	"	50
	59	"	75		90	"	65		120	"	45		150	"	50
	60	"	65		91	"	65		121	"	35		151	"	50
	61	"	75												

1865 S. Set of 121 Xylonite Copenhagen Ship Curves, containing one each curve as listed under No. 1864, in hard-wood Case . . . . . per set $ 70 00

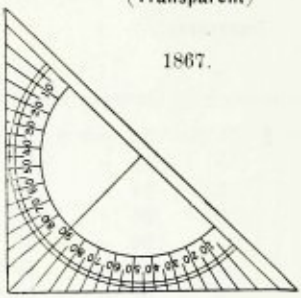
For Hard Rubber Ship Curves see page 205.
" Pearwood " " " " 227.

XYLONITE PROTRACTORS.

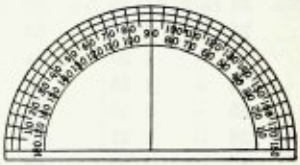
(Transparent)



No. 1866.



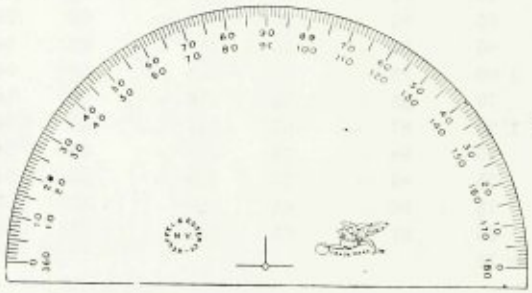
1867.



1868.

1866.	Xylonite Protractor Triangle, 30 × 60°,	5	in.,	div. to	1°	each	$		45
	" " " "	6	"	"	1	"			50
	" " " "	7	"	"	1	"			70
1867.	Xylonite Protractor Triangle, 45°,	5	in.	div. to	1°	"			50
	" " " "	6	"	"	1	"			70
	" " " "	7	"	"	1	"			90
1868.	Xylonite Semicircular Protractor, flat,	5	in.	div. to	½°	"			45
	" " " "	6	"	"	½	"			60
	" " " "	7	"	"	½	"			75
	" " " "	8	"	"	½	"		1	20
	" " " "	10	"	"	½	"		2	00

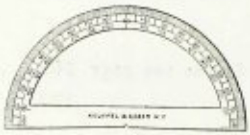
These Protractors are intended to replace the unsatisfactory horn protractors. As they are hand-divided they will not take the place of the fine engine-divided protractors for professional use.



No. 1868 A.

Transparent. Engine Divided. Fine Quality.

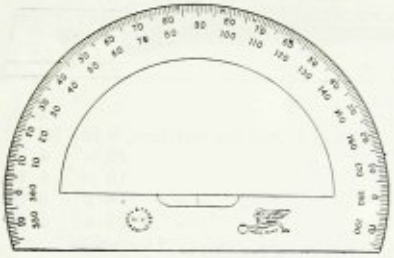
1868 A.	Xylonite Semicircular Protractor, no bevel,	5	in.	div. to	½°	each	$	1	50
	" " " "	6	"	"	½°	"		1	75
	" " " "	8	"	"	½°	"		2	25



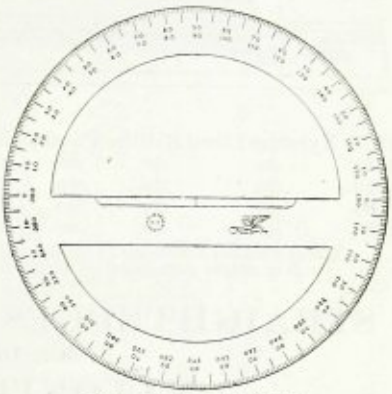
For Metal Protractors see page 167.
" **Horn** " " " **174.**
" **Paper** " " " **175.**
" **Ivory** " " " **176.**

FINE XYLONITE PROTRACTORS.

ENGINE DIVIDED, BEVELED EDGE.



No. 1869 and 1869W.



No. 1872 and 1872W.

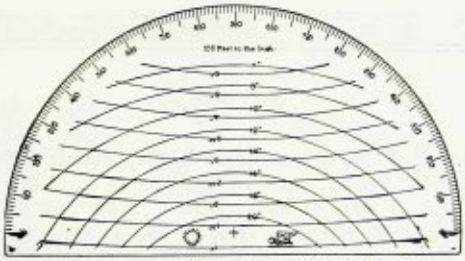
Transparent

1869.	Semicircular	Xylonite	Protractor,	beveled	edge,	6 in.,	½°,	each	$ 2 75
1870.	do.	do.	do.	"	"	8 "	½°	"	3 50
1871.	Circular	do.	do.	"	"	6 "	½°	"	3 50
1872.	do.	do.	do.	"	"	8 "	½°	"	4 50
1873.	do.	do.	do.	"	"	10 "	½°	"	5 50

Opaque, White

1869W.	Semicircular	Xylonite	Protractor,	beveled	edge,	6 in.,	½°,	each	$ 2 75
1870W.	do.	do.	do.	"	"	8 "	½°	"	3 50
1871W.	Circular	do.	do.	"	"	6 "	½°	"	3 50
1872W.	do.	do.	do.	"	"	8 "	½°	"	4 50
1873W.	do.	do.	do.	"	"	10 "	½°	"	5 50

RAILROAD CURVE PROTRACTORS.



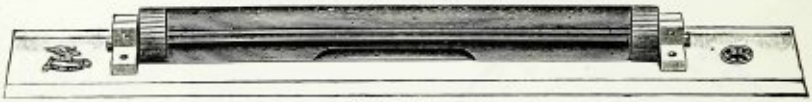
No. 1878. (**Transparent**)

1877. Xylonite Railroad Curve Protractor, 8 in., divided to half degrees, with circular Curves ½°, 1°, 1½°, 2°, 2½°, 3°, 3½°, 4°, 5°, 6°, 7°, 8°, scale 400 feet = 1 inch . . . . . each $ 2 75

1878. Xylonite Railroad Curve Protractor, 10 in., divided to half degrees, with circular Curves, 1°, 1½°, 2°, 2½°, 3°, 3½°, 4°, 5°, 6°, 7°, 8°, 10°, 12°, 14°, 16°, 18°, 20° scale 100 feet = 1 inch. . . . . " 3 25

XYLONITE-LINED PARALLEL RULES.

(Transparent Edges)



No. 1883.

							each
1881.	Xylonite Lined Rolling	Parallel	Rule, nickelplated mountings,			9 in.	$3 50
1882.	do.	do.	do.	do.	"	12 "	4 25
1883.	do.	do.	do.	do.	"	15 "	5 00
1884.	do.	do.	do.	do.	"	18 "	6 00
1885.	do.	do.	do.	do.	"	24 "	8 00

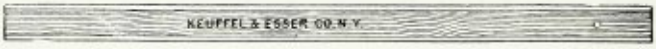
These Parallel Rules are substantially made and very accurate. The blade is of maple with beveled transparent Xylonite edges.

STRAIGHTEDGES AND T SQUARES

With Transparent

XYLONITE EDGES.

"Copyright, 1894, by Keuffel & Esser Co."



No. 1886.

1886. Xylonite Lined Straightedges, Maple, square edges,

	18	24	30	36	42	48	54	60 in.
each $	75	1 00	1 25	1 50	1 80	2 20	3 00	4 00

"Copyright, 1894, by Keuffel & Esser Co."



No. 1887.

No. 1888.

1887. Xylonite Lined T Squares, Maple blade, ebonized fixed head,

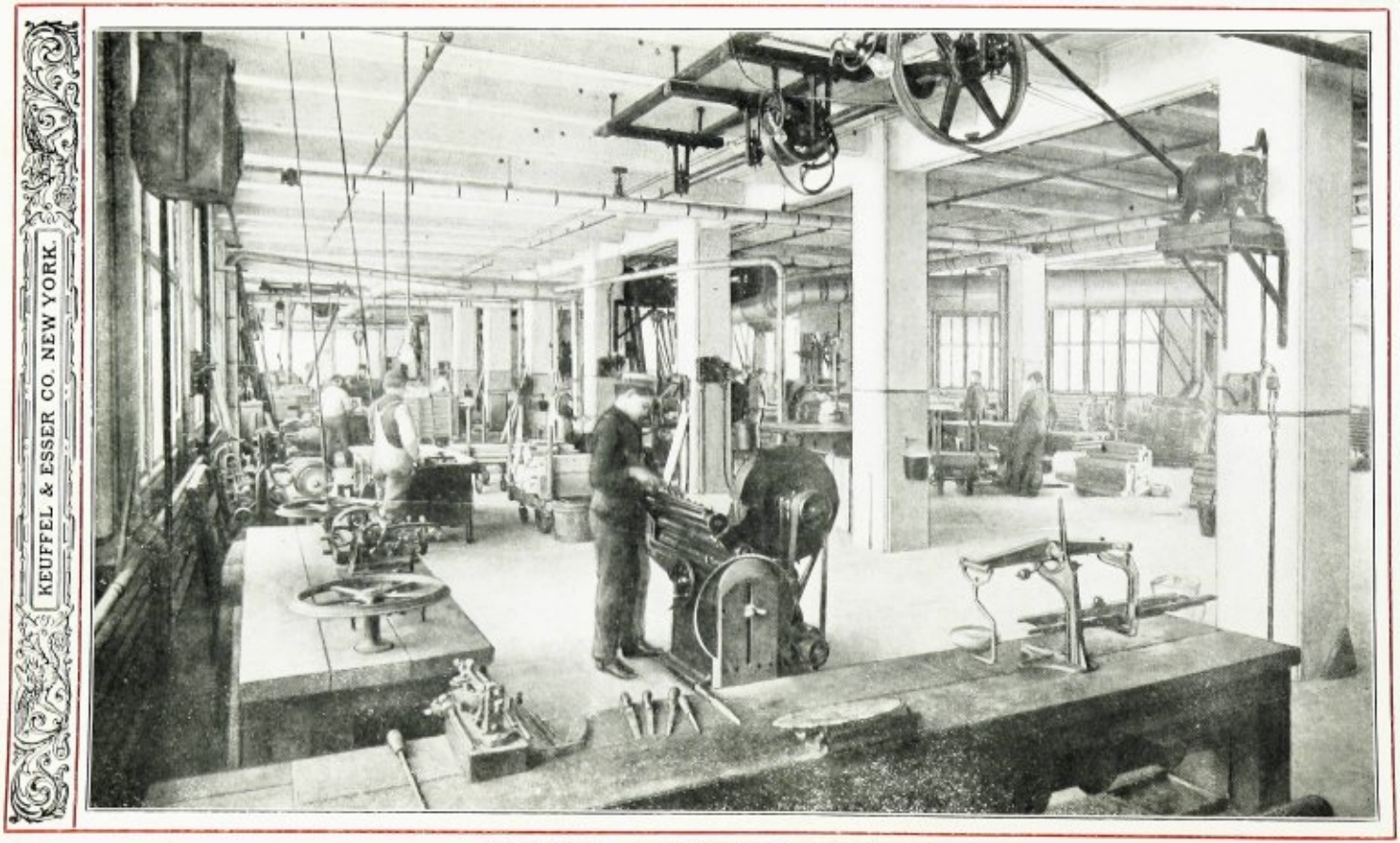
	15	18	24	30	36	42	48	54	60 in.
each	$1 00	1 10	1 50	1 85	2 15	2 50	3 00	4 00	5 00

1888. Xylonite Lined T Squares, Maple blade, ebonized shifting head, K. & E. Co. pattern, with 2 fine brass swivels. The 15 and 18-in. squares have one swivel.

	15	18	24	30	36	42	48	54	60 in.
each	$1 60	1 90	2 45	2 80	3 20	3 60	4 20	5 25	6 25



For other Straightedges and T Squares see: Steel—page 221, Wood—page 229.



SAW MILL. - FACTORIES, HOBOKEN N. J.



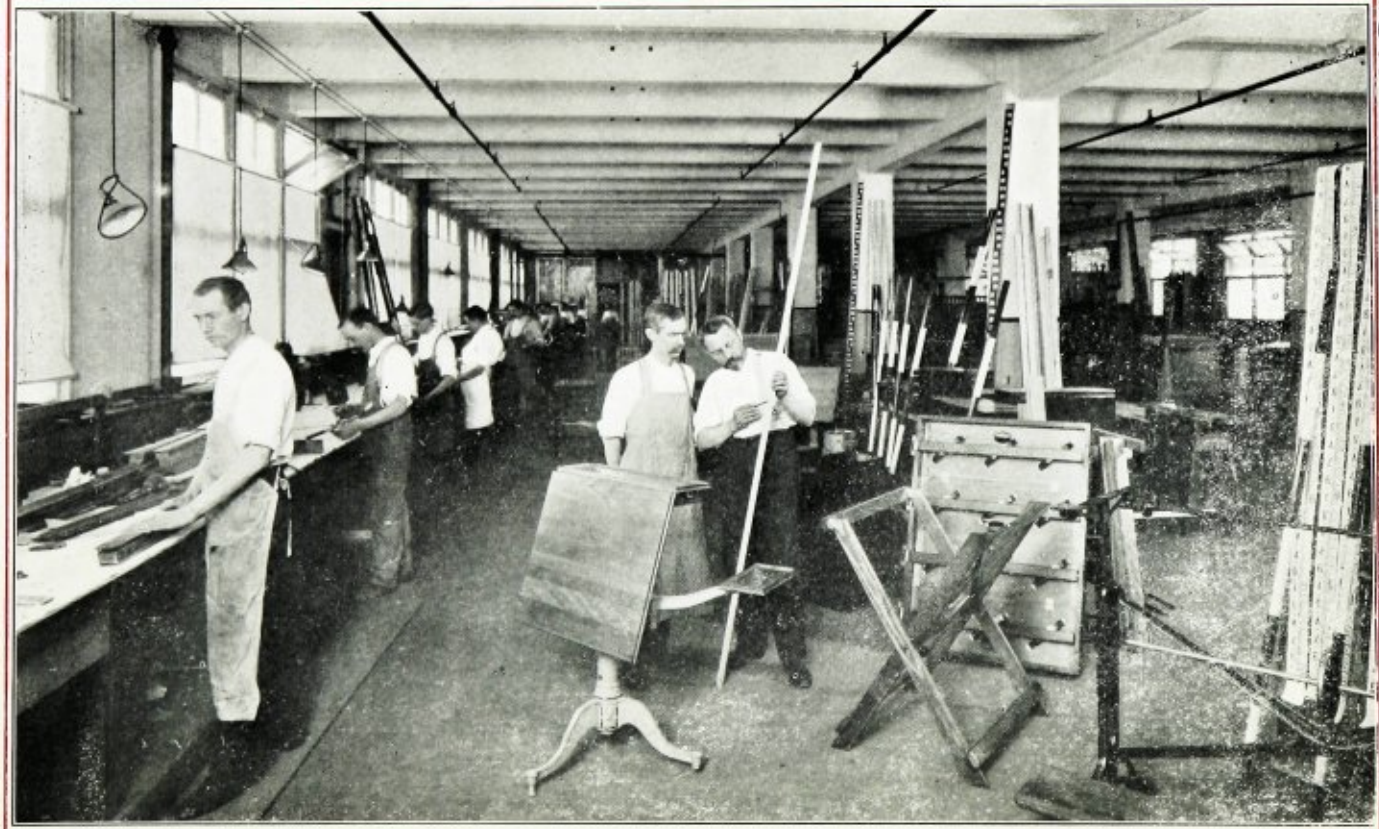
KEUFFEL & ESSER CO. NEW YORK.

MAKING OF WOODEN TOOLS, LEVELING RODS, ETC.—FACTORIES, HOBOKEN, N. J.

KEUFFEL & ESSER CO. NEW YORK.



MAKING OF DRAFTING ROOM FURNITURE, ETC.—FACTORIES, HOBOKEN, N. J.



KEUFFEL & ESSER CO. NEW YORK.

FINISHING WOODEN GOODS.—FACTORIES, HOBOKEN, N. J.

KEUFFEL & ESSER CO'S. RAILROAD CURVES



AWARDED

THE ONLY MEDAL

AT THE NATIONAL EXPOSITION

OF

RAILWAY APPLIANCES

CHICAGO, 1883.



XYLONITE RAILROAD CURVES.

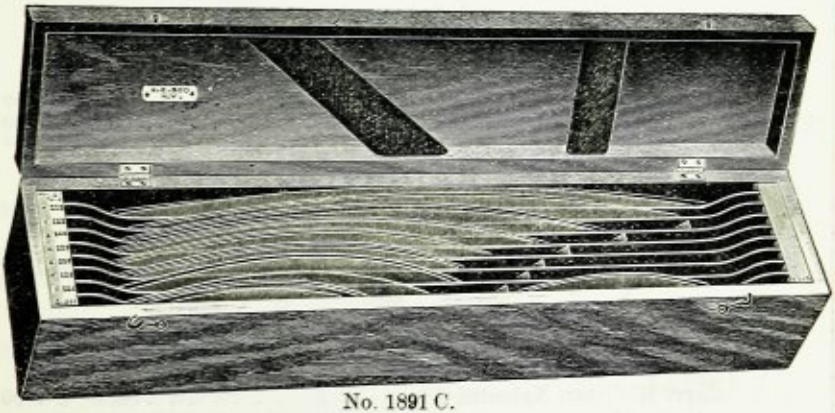
(Transparent)

These curves are cut with the same precision as our hard rubber and pearwood railroad curves and they are of the same superior special xylonite which we employ in the manufacture of other tools of this kind. They are put up in improved partitioned boxes (except set 1891), which prevent warping of the curves from mutual pressure while in their box. As the values of the contained curves are stamped on each compartment, the required curve is easily found.

1891. Xylonite Railroad Curves, 17 in set, viz: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in. radius, in wooden Box . . . . . set $ 15 00

1891 A. Xylonite Railroad Curves, 30 in set, viz : 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 35, 40, 45, 50, 60 in. radius, in wooden Box with Partitions . . . . . " 27 50

1891 B. Xylonite Railroad Curves, 50 in set, viz.: 1½, 2, 2½, 3, 3½ 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120 in. radius, in wooden Box with Partitions . . . . " 42 00



No. 1891 C.

1891 C. Xylonite Railroad Curves, **with Tangent**, 55 in set, viz. : 3, 3½, 4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 22, 23, 24, 25, 26, 27, 28, 30, 32, 34, 35, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200 in radius, in wooden Box with Partitions . . . . . set $ 55 00

1891 D. Xylonite Railroad Curves, **with Tangent**, marked in degrees and inches, to scale 100 feet = 1 inch, 41 in set, viz.:

0°.30′	=114.59 in.	3°.30′	= 16.37 in.	6°	= 9.55 in.	8°.30′	= 6.75 in.
1°.	= 57.30 "	3°.45′	= 15 28 "	6°.15′	= 9.17 "	8°.45′	= 6.55 "
1°.15′	= 45.84 "	4°	= 14.33 "	6°.30′	= 8.82 "	9°	= 6.37 "
1° 30′	= 38.20 "	4°.15′	= 13.48 "	6°.45′	= 8.49 "	9°.15′	= 6.20 "
1°.45′	= 32.74 "	4°.30′	= 12.73 "	7°.	= 8.19 "	9°.30′	= 6.04 "
2°	= 28.65 "	4°.45′	= 12.07 "	7°.15′	= 7.91 "	9°.45′	= 5.88 "
2°.15′	= 25.47 "	5°	= 11.46 "	7°.30′	= 7.64 "	10°	= 5.74 "
2°.30′	= 22.92 "	5°.15′	= 10.92 "	7°.45′	= 7.40 "	10°.30′	= 5.48 "
2°.45′	= 20.84 "	5°.30′	= 10.42 "	8°	= 7.17 "	11°	= 5.22 "
3°	= 19.10 "	5°.45′	= 9.97 "	8°.15′	= 6.95 "	11°.30′	= 4.99 "
3°.15′	= 17.63 "						

in wooden Box with Partitions . . . . set $ 42 00

1891 E. Xylonite Railroad Curves, **with Tangent**, marked in degrees and inches, to scale 100 feet = 1 inch, 55 in set, viz.:

0°.15′	=229.18 in.	3°.45′	= 15.28 in.	7°.15′	= 7.91 in.	11°.30′	= 4.99 in.
0°.30′	=114.59 "	4°	= 14.33 "	7°.30′	= 7.64 "	12°.	= 4.78 "
0°.45′	= 76.39 "	4°.15′	= 13.48 "	7°.45′	= 7.40 "	12°.30′	= 4.59 "
1°.	= 57.30 "	4°.30′	= 12.73 "	8°	= 7.17 "	13°	= 4.42 "
1°.15′	= 45 84 "	4°.45′	= 12.07 "	8°.15′	= 6.95 "	13°.30′	= 4.25 "
1°.30′	= 38.20 "	5°	= 11.46 "	8°.30′	= 6.75 "	14°	= 4.10 "
1°.45′	= 32.74 "	5°.15′	= 10.92 "	8°.45′	= 6.55 "	14°.30′	= 3.96 "
2°.	= 28 65 "	5°.30′	= 10.42 "	9°	= 6.37 "	15°	= 3.83 "
2°.15′	= 25.47 "	5°.45′	= 9.97 "	9°.15′	= 6.20 "	16°	= 3.59 "
2°.30′	= 22 92 "	6°	= 9.55 "	9°.30′	= 6.04 "	17°	= 3.38 "
2°.45′	= 20.84 "	6°.15	= 9.17 "	9°.45′	= 5.88 "	18°	= 3.20 "
3°.	= 19 10 "	6°.30′	= 8.82 "	10°.	= 5.74 "	19°	= 3.03 "
3°.15′	= 17.63 "	6°.45′	= 8.49 "	10°.30′	= 5.48 "	20°	= 2.88 "
3°.30′	= 16.37 "	7°	= 8.19 "	11°	= 5.22 "		

in wooden Box with Partitions . . . . set $ 55 00

These Xylonite Railroad Curves are made to correct radii, to a scale of 1 inch = 100 feet, both edges having the same radius. Formula: radius = ½ chord ÷ sin. ½ angle = 50 ÷ sin. ½ angle. The short tangents are very useful, as they enable the beginning of the curve to be correctly located on the drawing by means of the radia line separating the tangent from the curve.

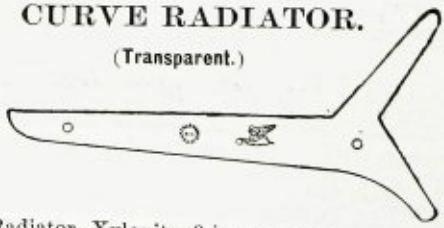
SEPARATE RAILROAD CURVES.

Railroad Curves, as described above, to any desired scale, cut to order:

1891 F. Separate Xylonite Railroad Curves. . . . . each $ 1 00
1891 G. do. do. do. with Tangent . . . . " 1 20

CURVE RADIATOR.

(Transparent.)



No. 1891 R.

1891 R. Curve Radiator, Xylonite, 9 in. . . . . each $ 2 00

A convenient tool for erecting perpendiculars (radii, secants) on curves. It can be used on either the convex or the concave edge of the curve. The drawing edge of the arm gives the radius.

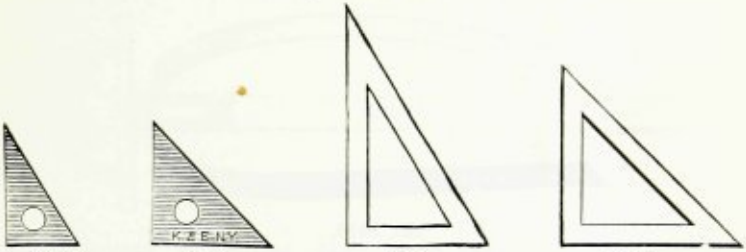


For Hard Rubber Railroad Curves, see page 206.

For Pearwood and Cardboard Curves, see page 228.

METAL TRIANGLES.

STEEL, NICKELPLATED.



No. 2000. 2001. 2002. 2003.

2000. Steel Triangles, **nickelplated,** solid, 30 × 60 degrees,

	2½	3	4 in.
each $	65	75	80

2001. Steel Triangles, **nickelplated,** solid, 45 degrees,

	2	2½ in.
each $	65	75

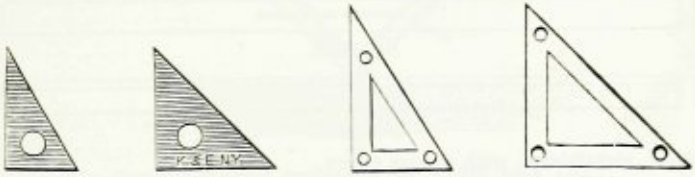
2002. Steel Triangles, **nickelplated,** open centre, 30 × 60 degrees,

	6	7	8	10½	15 in.
each $	3 20	3 50	3 85	4 25	6 50

2003. Steel Triangles, **nickelplated,** open centre, 45 degrees,

	5	6½	8	10	12 in.
each $	3 20	3 50	4 25	5 50	6 50

GERMAN SILVER.



No. 2005. 2006. 2007. 2008.

2005. German Silver Triangles, solid, 30 × 60 degrees,

	2	3	3¾ in.
each $	60	70	80

2006. German Silver Triangles, solid, 45 degrees,

	2	2½ in.
each $	60	70

2007. German Silver Triangles, open centre, 30 × 60 degrees,

	5½	7	8	10	12	14 in.
each $	2 50	2 75	3 00	4 00	5 00	6 50

2008. German Silver Triangles, open centre, 45 degrees,

	5	6	8	10	12 in.
each $	2 50	2 75	4 00	5 00	6 50

No. 2007 and 2008 have ivory buttons near the corners, to prevent soiling of the drawing. These buttons are thin and flat, to leave no impression on the paper.

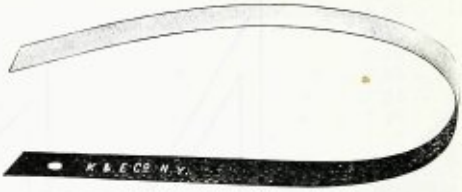


For Hard Rubber Triangles see page 202.

For Xylonite (transparent) Triangles see page 208.

For Wood Triangles see page 223.

STEEL STRAIGHTEDGES.



No. 2018.

2018. Steel, **flexible, enameled,** one side white, other side black.

15	18	24	30	36	42	48	60	72	in. long.
1½	1½	1½	1½	1½	2	2	2	2	in. wide.
each $1 00	1 20	1 60	2 20	2 65	3 10	3 70	4 60	5 50	

The Flexible Steel Straightedges are of well tempered spring steel 0.02 in. thick, and are coated with a flexible permanent enamel. They can be coiled up without injury, for carrying in hand baggage. (The 48-in. straightedge weighs but 10 oz.).



No. 2020.



No. 2022.



No. 2030.

2020. Steel, **nickelplated,** with square edges,

15	18	24	30	36	42	48	60	72 in. long
1⅛	1¼	1½	1¾	2	2¼	2½	2¾	3 " wide
1/20	1/20	1/18	1/16	1/16	1/14	1/14	1/13	1/10 " thick
each $ 1 10	1 25	1 90	2 75	3 50	4 50	6 00	8 50	12 00

2022. Steel, **nickelplated,** with square edges, **Extra heavy.**

36	42	48	60	72	84	96 in. long
2	2¼	2½	2¾	3	3¼	3½ " wide
1/8	9/64	5/32	11/64	3/16	13/64	7/32 " thick
each $ 5 25	6 60	8 25	11 25	14 75	19 00	24 00

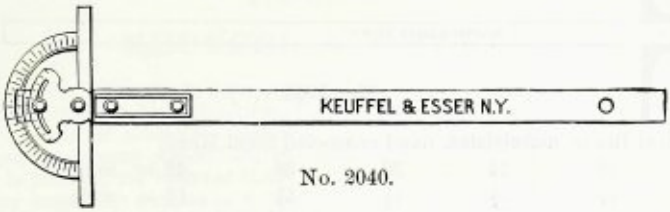
2030. Steel, **nickelplated,** one edge beveled,

15	18	24	30	36	42	48	60	72 in. long
1⅛	1¼	1½	1¾	2	2¼	2½	2¾	3 " wide
1/14	1/14	1/13	1/12	1/12	1/10	1/10	1/9	5/32 " thick
each $ 1 75	2 00	3 00	4 00	5 00	6 50	8 00	11 00	15 00

D. Dividing Steel Straightedges to sixteenths inches . . . per foot $ 1 00

STEEL T SQUARES.

NICKELPLATED BLADES.

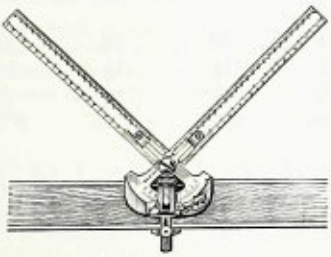


No. 2040.

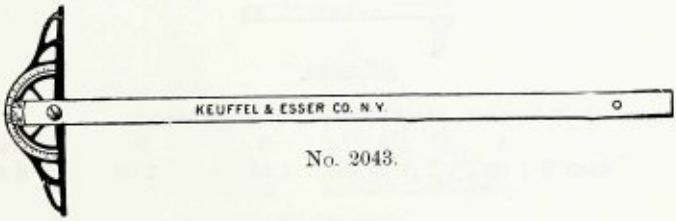
2040. Protractor T Squares, Steel Blade **nickelplated** with **German silver** double Protractor Head, the outside one reading to 1 minute, the inside one to 5 minutes, both with vernier.

24	30	36	in. long
$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	" wide
$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	" thick
each $ 28 00	30 00	32 00	

The double protractor makes this T square especially adapted for plotting and of **great** advantage in mapping mine surveys. In this connection see also



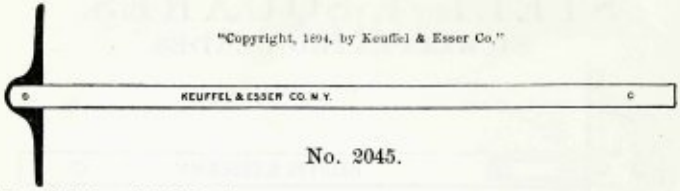
Paragon Drafting Instrument No. 1190, page 164.



No. 2043.

2043. Protractor T Square, Steel Blade **nickelplated**, shifting Bronze Head with Protractor divided to half-degrees, Vernier on end of blade, reading to minutes,

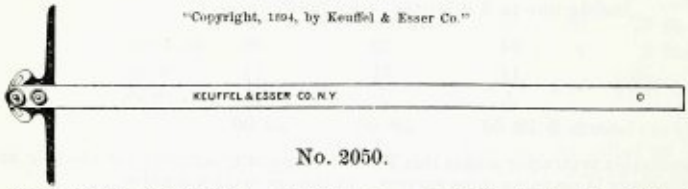
24	30	36	42	in. long
$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	" wide
$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	" thick
each $ 8 50	9 50	10 50	11 50	



No. 2045.

2045. Steel Blade, **nickelplated**, fixed enameled Steel Head,

18	24	30	36	42	in. long
$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	" wide
$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{14}$	" thick
each $ 3 00	3 50	4 50	5 50	7 00	



No. 2050.

2050. Steel Blade, **nickelplated**, shifting enameled Steel Head, with nickelplated swivel,

18	24	30	36	42	in. long
$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	" wide
$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{14}$	" thick
each $ 4 25	5 00	5 75	6 75	8 25	

ENGRAVER'S T SQUARES.



No. 2060.

2060. Engraver's T Squares, Steel Blade, fixed brass head,

4	6	8	10	12	in.
each $ 1 00	1 25	1 50	2 00	2 50	



No. 2065.

2065. Engraver's T Squares, Steel Blade, shifting brass head, with swivel,

4	6	8	10	12	in.
each $ 1 25	1 50	1 75	2 25	2 75	

WOODEN DRAWING TOOLS

MANUFACTURED BY

KEUFFEL & ESSER CO.

All the wooden goods enumerated in this catalogue (Triangles, T Squares, Drawingboards, Tables, Cabinets, Print Frames, etc.) are our own manufacture and are made of material seasoned in our own yards. We have specially designed machinery which insures correctness, and as the workmanship of our goods is perfect, we warrant them to remain correct.

Any carpenter can make a board that **looks** like a Drawingboard, or put together pieces of wood to look like a square, but the only guaranty of quality, accuracy and stability is in the reputation of the maker. As our patterns have been extensively imitated we beg to call special attention to our trade-mark and firm name



with which each wooden tool of our manufacture is stamped. The quality of goods so marked is warranted by us.

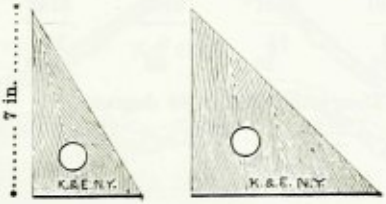
The "Pearwood" tools are guaranteed to be of **genuine** pear-tree wood.

On account of the extreme scarcity of real Ebony, the trades using this material have been forced to substitute stained wood of various kinds, while they have retained the designation Ebony.

We have followed this custom in describing our goods, although we furnish BLACK BOXWOOD where we designate Ebony. We have adopted black BOXWOOD because it is even superior to Ebony in hardness, smoothness and color.

TRIANGLES.

Triangles No. 2100, 30 × 60 degrees, match No. 2105 45 degrees, in size, because they have the same length of hypotenuse. Such matching sizes of the two shapes are listed directly under one another, throughout the list.



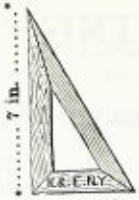
No. 2100. No. 2106.

Pearwood Triangles, solid, 30 × 60 degrees,

	No. 2100	2101
	7	9 in.
each $	10	12

Pearwood Triangles, solid, 45 degrees,

	No. 2105	2106
	$5\frac{3}{4}$	$7\frac{3}{8}$ in.
each $	10	12



No. 2110.



2121.

Pearwood Triangles, framed, 30 × 60 degrees,

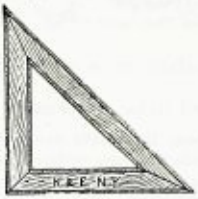
No.	2110	2111	2112	2113	
	7	9	11	14	in.
each $	18	24	30	35	

Pearwood Triangles, framed, 45 degrees,

No.	2120	2121	2122	2123	
	5¾	7⅞	9	11½	in.
each $	18	24	30	35	



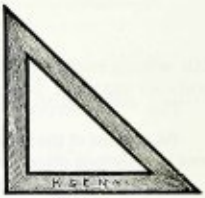
No. 2130



2141.



2150.



2161.

Pearwood lined Triangles, 30 × 60 degrees,

No.	2130	2131	2132	2133	2134	
	7	9	11	14	17	in.
each $	25	30	40	50	75	

Pearwood lined Triangles, 45 degrees,

No.	2140	2141	2142	2143	2144	
	5¾	7⅞	9	11½	14	in.
each $	25	30	40	50	75	

Mahogany Triangles, Ebony lined, 30 × 60 degrees,

No.	2150	2151	2152	2153	2154	2155	
	7	9	11	14	17	20	in.
each $	30	40	55	75	1 20	1 50	

Mahogany Triangles, Ebony lined, 45 degrees,

No	2160	2161	2162	2163	2164	2165	
	5¾	7⅞	9	11½	14	16¼	in.
each $	30	40	55	75	1 20	1 50	



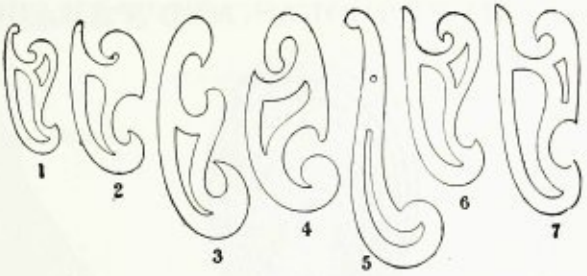
For Hard Rubber Triangles see page 202

For Xylonite (transparent) Triangles see page 208.

For Metal Triangles see page 219.

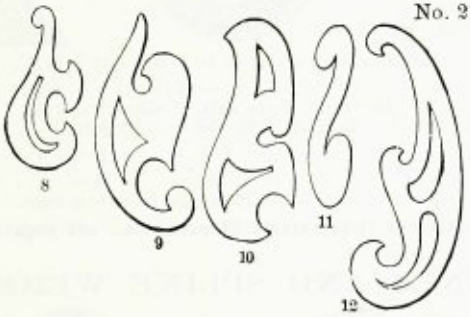
See Note, page 223, about Ebony.

PEARWOOD CURVES.



No. 2170.

Illustrations about 1/7 size.



2170. Pearwood Curves, fine finish,

No.	1	2	3	4	5	6	7	8	9	10	11	12
each $	20	25	30	30	30	25	30	25	30	35	20	35

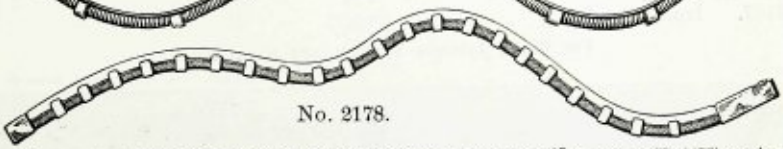
ADJUSTABLE CURVE RULES.



No. 2175.



No. 2176.



No. 2178.

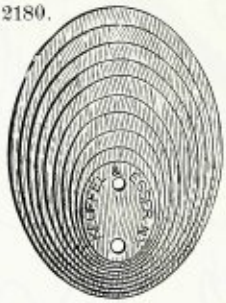
These patent curve rules consist of a ruling edge of rubber (Nos. 2175, 2177, 2178) or steel (No. 2176) in combination with a bar of soft lead. They will hold any curve into which they are bent.

2175. Adjustable Curve Rule, 14½ in. long . . . . . each $ 2 25
2176. do. do. 30 " " . . . . . " 3 30
2177. do. do. cheaper construction, 12 in. long " 1 00
2178. do. do. " " 24 " " " 1 75

For Hard Rubber Curves see page 203.
For Xylonite (transparent) Curves see page 210.

PEARWOOD
ELLIPSES, HYPERBOLAS AND PARABOLAS.

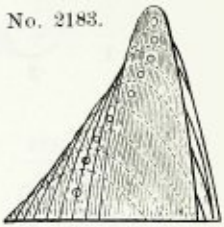
No. 2180.



No. 2182.



No. 2183.



2180. Ellipses, set of 10, major axis, 1½ to 6 in. (by ½ in.) . . . . set $ 2 00
2181. do. " " 6, " " 2 " 4½ " " ½ " . . . . . " 1 25

The ratio of the axis of ellipses is 3:4.

2182. Hyperbolas, set of 8, height 2 to 5½ in. (by ½ in.) . . . . . " 1 50
2183. Parabolas, " " 8, " 1¼ " 5⅝ " " ⅝ " . . . . . " 1 50
2184. do. " " 8, " 3½ " 14 " " 1½ " . . . . . " 3 00

The Hyperbolas and Parabolas have 4-in. base.

For Xylonite (transparent) Ellipses, etc., see page 211.

SPLINES AND SPLINE WEIGHTS.



Section of 2185.

Nos. 2185 with 2186 or 2186–1.

2187.

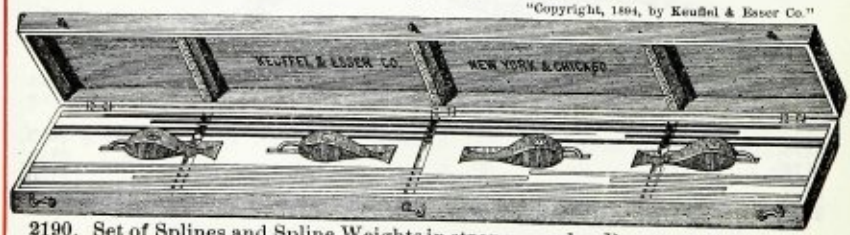
2185. Pearwood Splines, grooved,

	12	18	24	30	36	48	60 in.
each $	10	15	20	25	30	40	50

2186. Lead Weights for Splines, with finger, about 3¾ pounds . . each $ 85
2186–1. Lead " " " " " 8 " . . " 1 25
2187. Iron " " " (no finger) " 3¼ " . . " 50

For Black Xylonite Splines, see page 209.

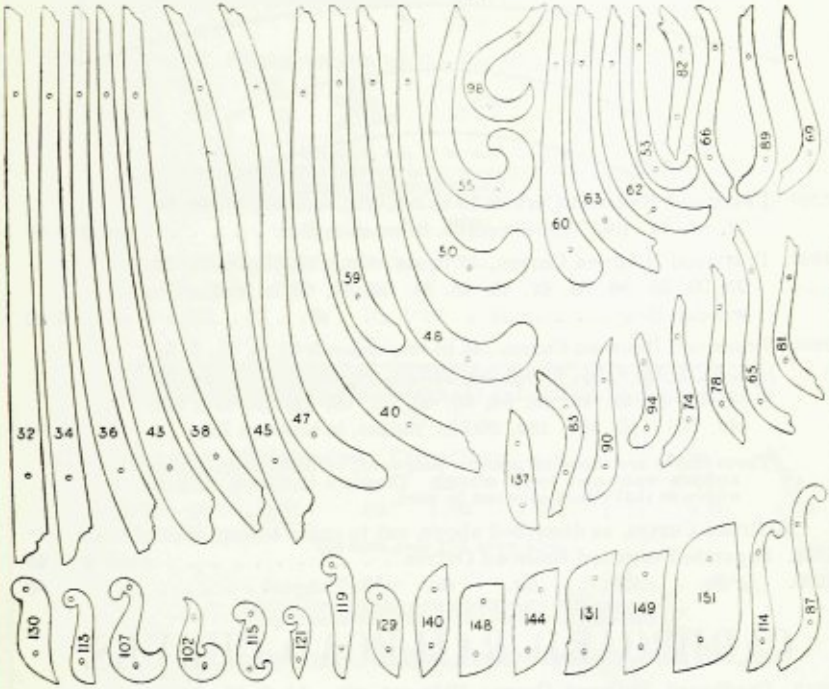
"Copyright, 1894, by Keuffel & Esser Co."



2190. Set of Splines and Spline Weights in strong wooden Box, cont'g:
4 Spline Weights, No. 2186,
1 each Xylonite Splines, No. 1859B, 12, 18, 24, 30, 36, 42 in.
1 " Pearwood " " 2185, 12, 18, 24, 30, 36, 48 " set $ 10 00

PEARWOOD SHIP CURVES.

Illustrations about ½ size.



No. 2195.

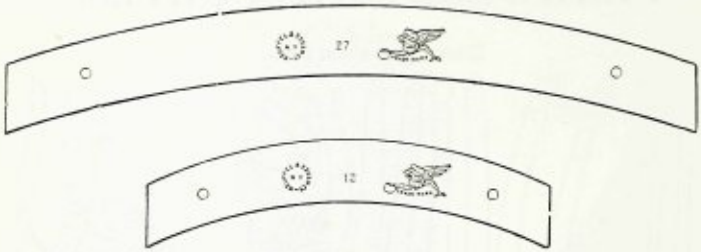
2195. Separate Pearwood Copenhagen Ship Curves,

No. 32	each	$ 70	No. 59	each	$ 50	No. 83	each	$ 30	No. 119	each	$ 30
34	"	70	60	"	40	87	"	35	121	"	25
36	"	70	62	"	45	89	"	40	129	"	25
38	"	70	63	"	45	90	"	35	130	"	30
40	"	70	65	"	45	94	"	30	131	"	25
43	"	70	66	"	30	98	"	30	137	"	25
45	"	70	69	"	30	102	"	25	140	"	25
47	"	70	74	"	30	107	"	30	144	"	25
48	"	60	78	"	30	113	"	25	148	"	25
50	"	50	81	"	30	114	"	30	149	"	25
53	"	35	82	"	30	115	"	25	151	"	30
55	"	40									

2195 S. Set of 45 Pearwood Copenhagen Ship Curves, containing one each curve as listed under No. 2195, in hardwood Case . . . . . set $ 22 00

For Hard Rubber Ship Curves, see page 205.
" **Xylonite** " " " " **213.**

PEARWOOD RAILROAD CURVES.



2200. Pearwood Railroad Curves, 10 in set, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 in. radius, in wooden Box . . . . . set $ 3 50

2202. Pearwood Railroad Curves, 17 in set, viz.: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 in. radius, in wooden Box . . . . . " 6 00

2204. Pearwood Railroad Curves, 44 in set, viz.: 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 42, 48, 54, 60, 66, 72, 78, 84, 90, 100, 110, 120, 130, 140, 160, 180, 200 in. radius, in wooden Box . . " 12 00

These curves are made of genuine pearwood, by special machinery and are warranted to be correct. They are the same on both edges, so that either edge can be used.

Railroad Curves, as described above, cut to order to any desired scale.

2208. Separate Pearwood Railroad Curves . . . . . each $ 45

2209. do. do. do. do. with Tangent . . . . . " 60

CARDBOARD RAILROAD CURVES.

2210. Cardboard Railroad Curves, 30 in set, viz.. 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 35, 40, 45, 50, 60 in. radius, in wooden Box . set $ 5 25

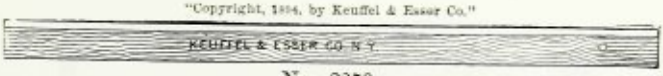
2211. Cardboard Railroad Curves, 50 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120 in. radius, in wooden Box . . . . . " 8 50

2212. Cardboard Railroad Curves, 100 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 12½, 13, 13½, 14, 14½, 15, 15½, 16, 16½, 17, 17½, 18, 18½, 19, 19½, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120, 130, 140, 150, 160, 180, 200, 220, 240 in. radius, in wooden Box . . " 14 50

For Rubber Railroad Curves see page 206.
" Xylonite (transparent) do. " " 218.

STRAIGHTEDGES.

"Copyright, 1894, by Keuffel & Esser Co."

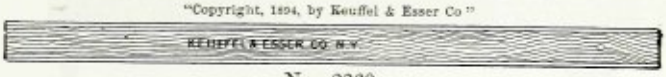


No. 2250.

2250. Pearwood Straightedges, thick, one edge beveled,

	12	15	18	24	30	36	42 in.
each $	12	15	20	25	30	40	50

"Copyright, 1894, by Keuffel & Esser Co."



No. 2260.

2260. Hardwood lined Straightedges, thin, square edges,

	24	30	36	42	48	54	60	72	84	96	120 in.
each $	35	45	60	75	1 00	1 20	1 50	2 00	2 75	3 75	5 00

"Copyright 1894, by Keuffel & Esser Co."



No. 2270.

2270. Mahogany Straightedges, Ebony lined, thin, square edges,

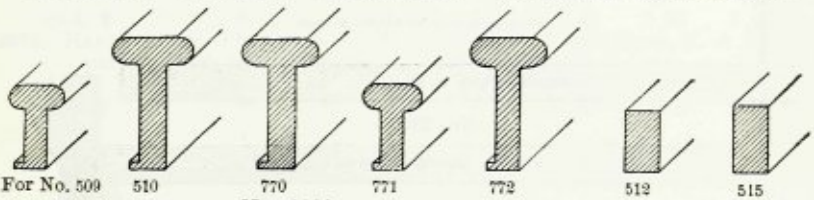
	24	30	36	42	48	54	60	72 in.
each $	50	60	80	1 00	1 35	1 60	2 00	2 75

See Note, page 223, about Ebony.



For Xylonite (transparent) and Steel Straightedges see pages 216, 220.

BARS FOR BEAM COMPASSES.



No. 2280. 2281.

2280. Hardwood Bars for Beam Compasses Nos. 509, 510, 770, 771 and 772.

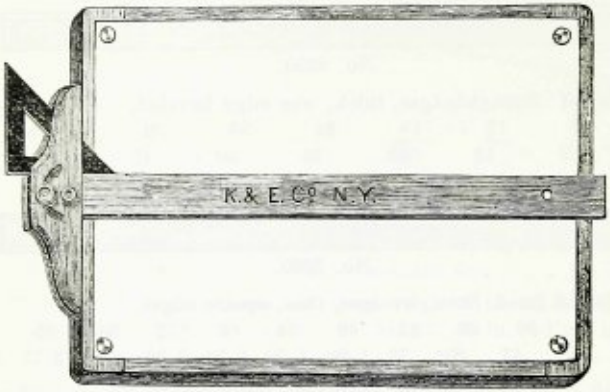
	24	30	36	42	48	60 in.
each $	30	35	40	45	55	70

2281. Hardwood Bars for Beam Compasses Nos. 512 and 515,

	24	30	36	42	48	60 in.
each $	20	25	30	35	40	50

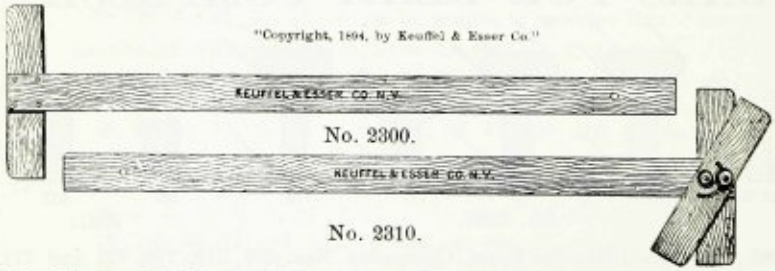
In ordering these bars, please state catalogue number of beam compasses.

WOODEN T SQUARES.



K. & E. CO. PATTERN.

We call attention to the K. & E. Co. pattern of double-head (shifting) T Squares. These T Squares have two swivels, of which the smaller serves as pivot on which the head shifts, while the larger, placed near the end of the blade for better leverage, and passing through an arched recess in the upper head, clamps the shifting head rigidly. The two heads of these T Squares are separated to the extent of the thickness of the blade, and either head is made to lie flush with the drawing board so that a triangle can be applied up to the edge of the board by passing it between the two heads of the T Square. A glance at the illustration will show the great superiority of these T Squares over all others.



No. 2300.

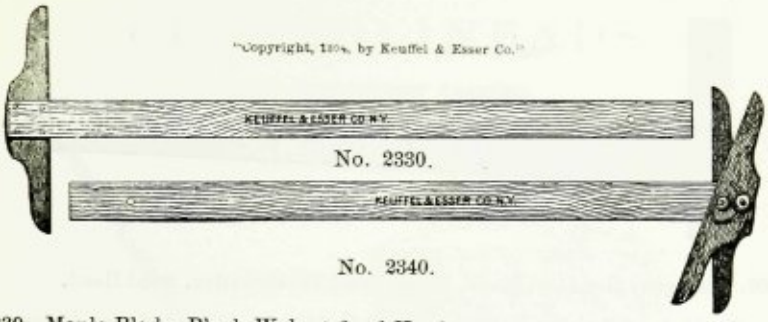
No. 2310.

2300. Pearwood Blade and Head, fixed Head,

	15	18	21	24	30	36	42	48 in.
each $	25	28	30	35	45	55	65	90

2310. Pearwood Blade and Head, shifting double Head, K. & E. Co. pattern with two brass milled-head swivels (the 15 and 18 in. squares have one swivel),

	15	18	21	24	30	36	42	48 in.
each $	70	75	80	90	1 00	1 15	1 25	1 50



No. 2330.

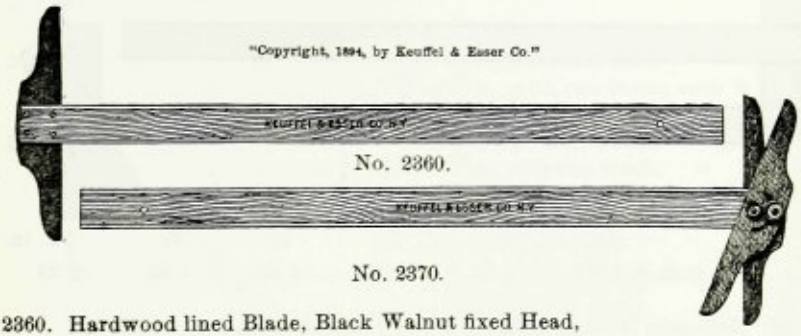
No. 2340.

2330. Maple Blade, Black Walnut fixed Head,

	18	21	24	30	36	42	48	54 in.
each $	45	50	60	75	90	1 05	1 20	1 40

2340. Maple Blade, Black Walnut shifting double Head, K. & E. Co. pattern, with two fine, brass milled-head swivels (the 18 in. square has one swivel),

	18	21	24	30	36	42	48	54 in.
each $	1 00	1 10	1 20	1 35	1 50	1 65	1 85	2 10



No. 2360.

No. 2370.

2360. Hardwood lined Blade, Black Walnut fixed Head,

	24	30	36	42	48	54	60	72 in.
each $	75	90	1 05	1 25	1 50	1 75	2 25	3 00

2370. Hardwood lined Blade, Black Walnut shifting double Head, K. & E. Co. pattern, with two fine, brass milled-head swivels,

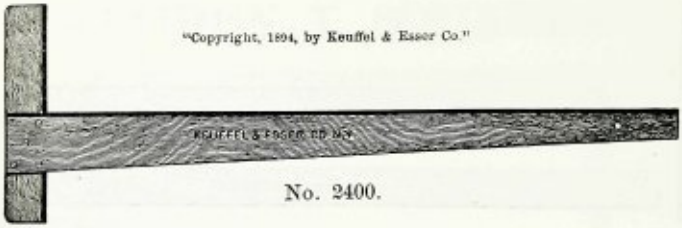
	24	30	36	42	48	54	60	72 in.
each $	1 35	1 50	1 65	1 85	2 15	2 50	3 00	4 00



No. 2390.

2390. Hardwood Blade, tapered, Black Walnut fixed Head,

	24	30	36	42	48 in.
each $	65	80	1 00	1 20	1 50

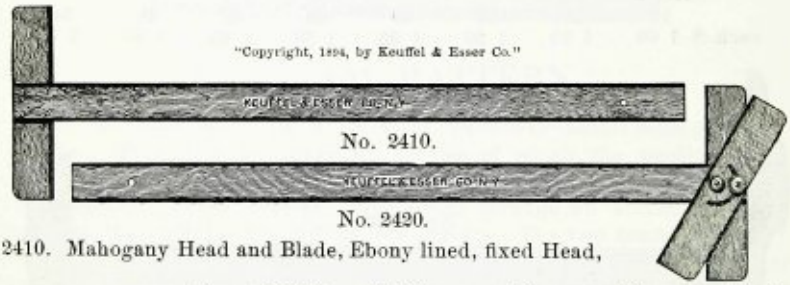


No. 2400.

2400. Mahogany Head and Blade, Ebony lined, beveled edge, fixed Head.

The blade of Nos. 2390 and 2400 is tapered and very wide at the base, to prevent spring at the further (free) end. The drawing edge is in line with the middle of the head.

	30	36	42	48	54 in.
each	$ 1 20	1 40	1 60	1 85	2 25



No. 2410.

No. 2420.

2410. Mahogany Head and Blade, Ebony lined, fixed Head,

	24	30	36	42	48	54 in.
each	$ 1 00	1 20	1 40	1 60	1 85	2 25

2420. Mahogany Head and Blade, Ebony lined, shifting double Head, K. & E. Co. pattern, with two fine brass milled-head swivels,

	24	30	36	42	48	54 in.
each	$ 1 75	2 00	2 25	2 50	2 80	3 25

See Note, page 223, about Ebony.

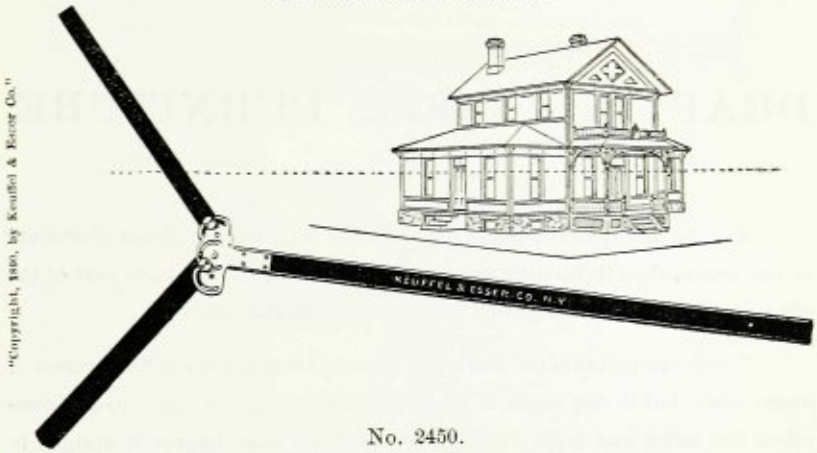
Hand-polished **T** Squares, or such of fancy combinations of different kinds of wood, made to order.



For Xylonite T squares (transparent) see page 216.
For Steel T squares, see page 221.

CENTROLINEADS

FOR PERSPECTIVE DRAWING.

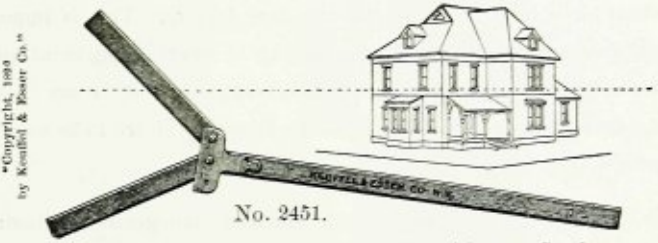


No. 2450.

2450. Keuffel & Esser Co's. Centrolinead, Ebony, German silver mountings, Blade 42 in., Arms 15 in. with two Studs, each $ 11 00

See Note, page 223, about Ebony.

2450–2. do. do. hardwood, black, brass mountings, Blade 42 in., Arms 15 in., with two Studs, " 7 00



No. 2451.

2451. Centrolinead, pearwood, brass swivels, with two Studs, Blade 24 in., Arms 10 in. each $ 3 00

2452. do. do. do. " 30 " " 11 " " 3 50

2453. do. do. do. " 36 " " 12 " " 4 00

Directions furnished with Centrolineads

Centrolineads are used when the vanishing point of a perspective drawing is beyond the drawing board, and are employed as follows: Draw a horizontal line (line of sight) and a vertical line crossing it near its end toward the vanishing point. Place the two studs on this vertical line, equidistant from the horizontal, and about 8 to 16 inches from it, according to the size of the angle. The angle at which the two arms are to be set, is determined as follows: Multiply the distance of either of the studs (from the horizontal line) by itself, divide the product by the distance of the vanishing point from the vertical line, and the quotient will be the distance from the vertical line toward the drawing, at which the centre of the head (the point at which the lines of the inner edges of the arms intersect the horizontal line), should be placed. For instance, if either stud be 8 inches from the horizontal line and the vanishing point 24 inches beyond, then $8 \times 8 = 64 \div 24 = 2\frac{2}{3}$ inches, i. e., the point of intersection should be placed $2\frac{2}{3}$ inches from the vertical line, towards the drawing. To draw from the other side, transfer the outer arm to the socket at the other end of the blade-head and find the angle as before.

DRAFTING ROOM FURNITURE.

For the first time our catalogue contains all Drafting Room Furniture in one group, thus facilitating the selection of this very important part of the office equipment of the Engineer, Architect and Draftsman.

The development of the making of Modern Drafting Room Furniture is of recent years, but it has made rapid strides and our assortment to-day comprises the latest and most complete line and the most improved designs in **Blueprinting Apparatus, Drawing Tables, Chests of Drawers, Filing Cabinets** etc., for the Drafting Room.

All these goods are of our own manufacture and special facilities for making them have been provided in our new factory. This is important, as it gives us absolute control of the quality of every component part of our products. Our workmanship is of the highest grade and we are therefore able to guarantee every piece of our Drafting Room furniture to be exactly as we represent it.

It is impossible to show quality and finish of such goods by illustration and description, and the buyer who does not want to be disappointed must rely on the reputation and standing of the manufacturer.

We are so well convinced of the superior quality of our Drafting Room Furniture that *we will take back at our expense, any article which does not prove satisfactory to the buyer upon receipt.*



K. & E. Co. Print Frames and Bath Trays.

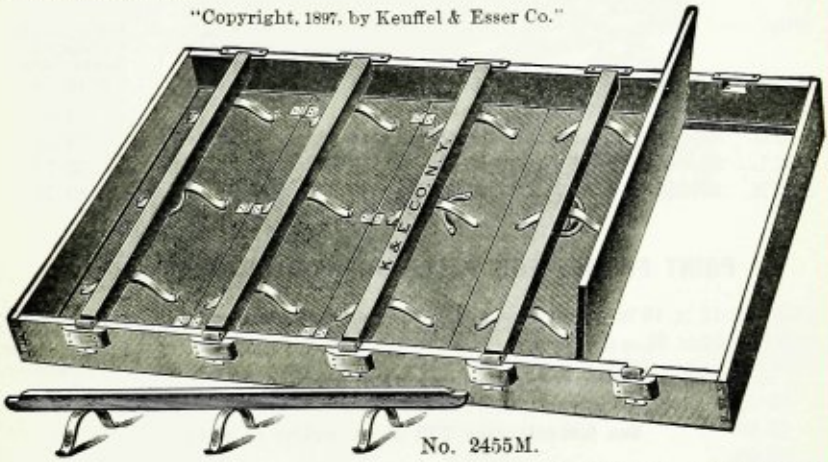
SUPERIOR QUALITY PRINT FRAMES OF SOLID OAK.

These print frames differ greatly from those usually offered. They are made of carefully selected, thoroughly seasoned oak, are of perfect workmanship and have brass trimmings. The springs are as heavy and as numerous as the strength of the glass will allow, to insure perfect contact. The spring catches for the bars are protected by wooden casings, as shown in the cut. The spring bars are metal-tipped at both ends to reduce wear. The frames are made to stand the exposure to the weather incidental to their use. The great advantage of solid oak frames of best quality and workmanship, over the cheaper kind, is their lesser liability to warp and shrink and thereby to break the glass.

For sizes larger than 24 × 30 in. only Plate Glass should be used, on account of its greater strength. It makes better prints and will be found more economical also for the smaller sizes.

The Pads listed with the frames are a thick elastic padded cotton fabric. (For Felt Pads see next page.)

"Copyright, 1897, by Keuffel & Esser Co."



No. 2455M.

Old Nos.				Frame only.	With cotton pad.	With pad and double thick glass.	With pad and polished plate glass.
242	2455 E.	20×24 in.	ea.	$ 7 20	$ 7 95	$ 9 60	$ 10 75
243.	2455 G.	24×30 "	"	9 50	10 60	13 20	16 00
244.	2455 H	30×42 "	"	14 75	16 75		25 75
244-1.	2455 L.	36×48 "	"	20 00	22 60		36 90
245.	2455 M.	36×60 "	"	23 25	26 50		44 25
245-1.	2455 O.	42×60 "	"	26 00	29 75		50 25
245-2.	2455 P.	42×72 "	"	33 00	37 50		63 00

The above prices cover crating for shipment.

Other sizes made to order.

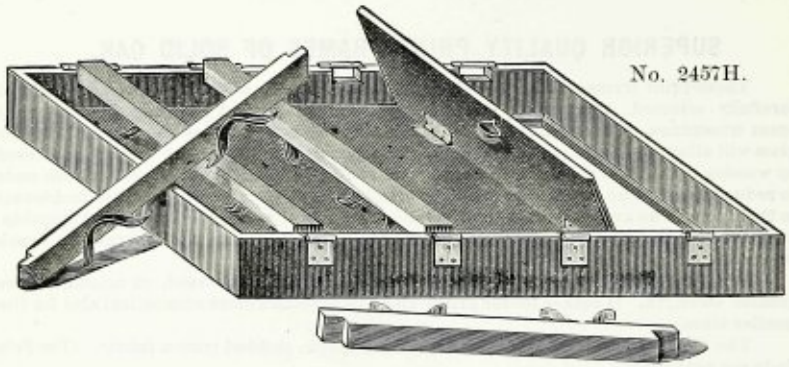
In ordering Print Frames please state whether pad is wanted, and whether double-thick or polished plate glass, or none.

The Glass is packed by an expert glass-packer, but we are not responsible for breakage of glass in transit.

We insure Plate Glass against breakage in transit when directed to do so.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

PRINT FRAMES.—TRADE QUALITY. (HARDWOOD.)



No. 2457H.

Old Nos.			Frame only.	With cotton pad	With pad and double thick glass	With pad and polished plate glass.
242 B.	2457 E.	20×24 in. . . . each	$ 6 50	$ 7 25	$ 8 90	$ 10 00
243 B.	2457 G.	24×30 " . . "	8 00	9 10	11 70	14 50
244 B.	2457 H.	30×42 " . . "	12 50	14 50		23 50
244 C.	2457 L.	36×48 " . . "	16 25	18 85		33 15
245 B.	2457 M.	36×60 " . . "	18 75	22 00		39 75

PRINT FRAMES FOR PATENT OFFICE DRAWINGS, &c.

242½.	2458 A.	11 × 16 in., hardwood, with double thick glass and pad, each	$ 4 00
243½.	2458 C.	16 × 21 " " " " " " " " " "	6 00

The above prices cover crating for shipment.

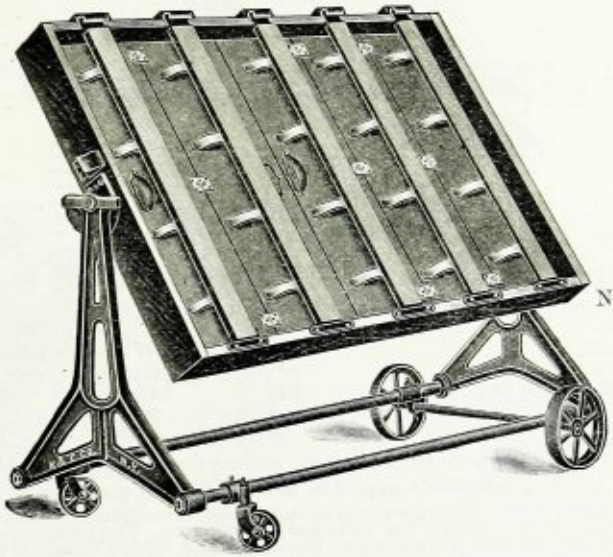
See foot-note page 235 about packing of glass.

PADS FOR PRINT FRAMES.

	Padded Cotton.			Felt.	
11×16 in.				2461 A. . . . . each	$ 50
16×21 "				2461 C. . . . . "	90
20×24 "	2460 E. . . . . each	$	75	2461 E. . . . . "	1 30
24×30 "	2460 G. . . . . "		1 10	2461 G. . . . . "	2 00
30×42 "	2460 H. . . . . "		2 00	2461 H. . . . . "	3 50
36×48 "	2460 L. . . . . "		2 60	2461 L. . . . . "	4 75
36×60 "	2460 M. . . . . "		3 25	2461 M. . . . . "	6 00
42×60 "	2460 O. . . . . "		3 75	2461 O. . . . . "	7 00
42×72 "	2460 P. . . . . "		4 50	2461 P. . . . . "	8 50

The prices of print frames 2457 E to M, are **f. o. b. New York.** Owing to the relatively high cost of transportation we must add transportation charges **when delivering these goods from our Branches.**

PRINT FRAMES ON WHEEL CARRIAGE.



No. 2462M

Nos. Old	Carriage with frame	No glass or pad.	With cotton pad.	With pad and double thick glass.	With pad and polished plate glass.
248-3.	2462 G. 24×30 in. each	$ 30 50	$ 31 60	$ 34 20	$ 37 00
248-4.	2462H. 30×42 " "	38 50	40 50		49 50
248-5.	2462L. 36×48 " "	46 00	48 60		62 90
248-6.	2462M. 36×60 " "	50 25	53 50		71 25
248-7.	2462O. 42×60 " "	54 50	58 25		78 75
248-8.	2462P. 42×72 " "	64 50	69 00		94 50

The above prices cover crating for shipment.

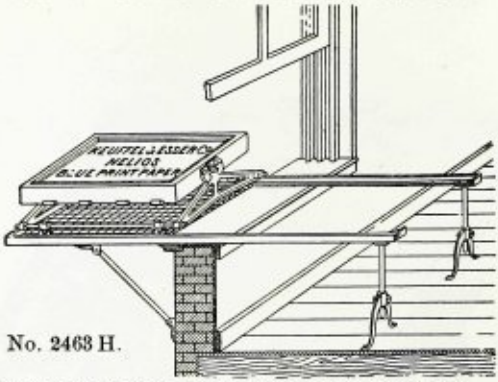
The Carriages are of iron, of most practical and substantial construction. They have one pair of wheels on a common axle and two swiveling wheels. The print frame revolves in the standards and is provided with two spring stops which hold it horizontal and also serve as brakes to hold the frame at any slant during exposure. The Print Frames are our regular solid oak frames, as listed on page 235.

See foot-note page 235 about packing of glass.

The prices on this page are **f. o. b. New York.** Owing to the relatively high cost of transportation we must add transportation charges **when delivering these goods from our Branches.**

PRINT FRAMES ON CARRIAGE, ON RAILS,

FOR EXPOSING OUTSIDE OF WINDOW.



No. 2463 H.

Frame and Mountings (carriage, rails and supports),

Old Nos.			No glass or pad	With cotton pad.	With pad and polished plate glass
2463 H.	frame	30 × 42 in., each . . .	$43 75	$45 75	$54 75
2463 L.	"	36 × 48 " " . . .	54 00	56 60	70 90
2463 M.	"	36 × 60 " " . . .	58 75	62 00	79 75
249					
249 P					

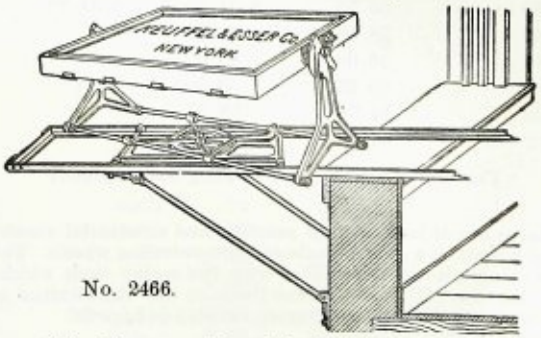
The above prices include crating for shipment.

See foot-note page 235 about packing of glass.

This is the most practical, convenient and durable arrangement for exposing print frames outside of a window. The rails are of angle iron. The carriage, which runs on four wheels is well proportioned and less bulky, and lighter than the usual ones, although stronger. The frame revolves in the standards of the carriage, which are provided with spring stops, as described under No. 2462, etc., on page 237. The frames are our regular solid oak frames, as listed on page 235.

IN ORDERING PLEASE STATE:

1. Width and height of open window.
2. Thickness of wall.
3. Width of window sill.
4. Height of window sill.



No. 2466.

Print Frame on Turntable Carriage on Rails.

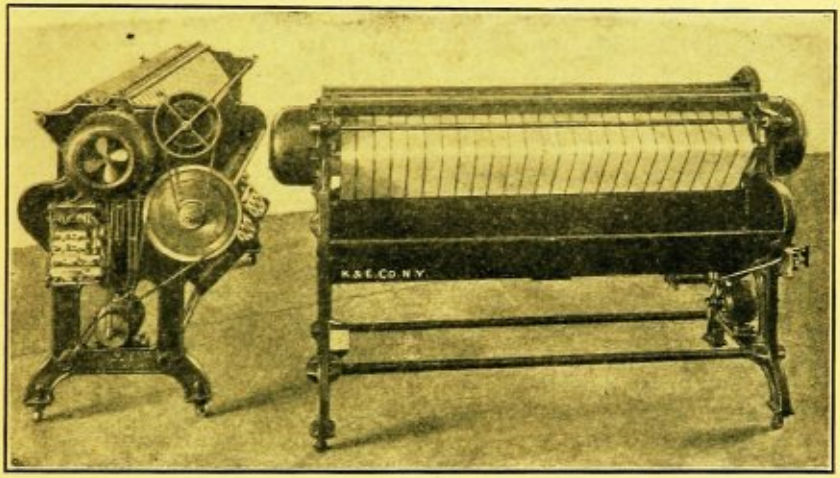
We make the Print Frames 2463 also with revolving carriage, to turn the frame to face the sun.

2466 H.	Revolving Carriage, for frame 30×42 in., extra	each,	$20 00
2466 L.	" " " " 36×48 " "	"	20 00
2466 M.	" " " " 36×60 " "	"	20 00

The above prices include crating for shipment,

The prices on this page are **f. o. b. New York.** Owing to the relatively high cost of transportation we must add transportation charges **when delivering these goods from our** Branches.

CHAMPION CONTINUOUS BLUEPRINTING MACHINE.



No. 2475.

2475. Champion Continuous Blueprinting Machine, complete, with two Mercury Vapor Lamps for 110 or 220 volt D. C., printing surface 54 in. wide $850 00

The above price includes crating for shipment.

In our Champion Continuous Blueprinting Machine, we offer an ideal printing machine which reaches the greatest degree of perfection yet attained by any, in the important features of closeness of contact, low current consumption, compactness and convenience of operation.

The Champion Machine consists essentially of a revolving glass cylinder, around which the paper and tracings are passed for exposing. The cylinder rotates in ball bearings, and will print tracings up to 54" wide, and of any length.

The printing light is furnished by mercury-vapor lamps placed inside the rotating glass cylinder, which is so constructed that practically the entire circumference is available for printing, a small strip only being reserved for the insertion and exit of the paper and tracings. Thus all the light produced inside the cylinder is directly utilized for printing, instead of being partially wasted on blank space or dispersed by reflectors.

This feature reduces the amount of electric current necessary for a given amount of work, and shortens the time required to produce the prints; both points of great practical importance.

Perfect contact is obtained by means of a set of flat rubber belts, which on account of their elasticity conform exactly to the contour of the printing surface.

The separation of this contact producing medium into separate bands prevents air from being entrapped between it and the paper and the usual bridging-over of small depressions or irregularities in the glass, as is the case with non-elastic blankets. This feature, together with the flexible and uniform pressure of the separate rubber bands, brings the tracing and paper so closely together as to approximate a vacuum contact and renders the finest lines and shading clearly defined in the prints.

Feeding is done at the top of the machine, from the front, the tracings and paper being fed downwards over the feeding shelf, with the tracings on top, right-side up. Separate sheets may be fed in with their respective tracings, or the blueprint paper may be fed in continuously from a roll on a removable bar and the tracings successively laid out for exposure on the paper. That the tracings are on top and right-side up, enables the operator to easily watch and check his work.

The completed prints and tracings are delivered by the action of the rubber belts into a box or hopper conveniently located under the cylinder. The delivery end being at the top behind and close to the feeding slot, many tracings from which duplicate prints are required, may be fed again around the cylinder as soon as the last end has gone in, and thus a continuous printing operation may be done with a single tracing, which is often a considerable saving of light, time and paper.

The speed changes run in easy stages between wide limits; allowing proper exposure from the slowest blackprint and negative work up to the most highly sensitized blueprint paper. A small fan is placed at one end of the glass cylinder to produce a constant current of air and prevent undue heating.

The machine is remarkably light running, as the glass cylinder is supported in ball bearings, and the only work expended in operating it is the carrying forward of the paper by means of the rubber belts, which require but a very small amount of power.

The whole machine needs but little attention, as it is compact and simple in construction. The tention of the rubber belts can be readily adjusted.

The Champion Machine is completely wired and self-contained, and requires only connecting with the circuit.

K & E VERTICAL CYLINDRICAL ELECTRICAL PRINT FRAMES.

This apparatus consist of two sections of curved glass, together forming a cylinder which rotates on a circular base. It **requires a floor space of about 36 x 42 inches.** The lamp is suspended in the axial line of the cylinder, and its travel is regulated by a variable pendulum escapement.

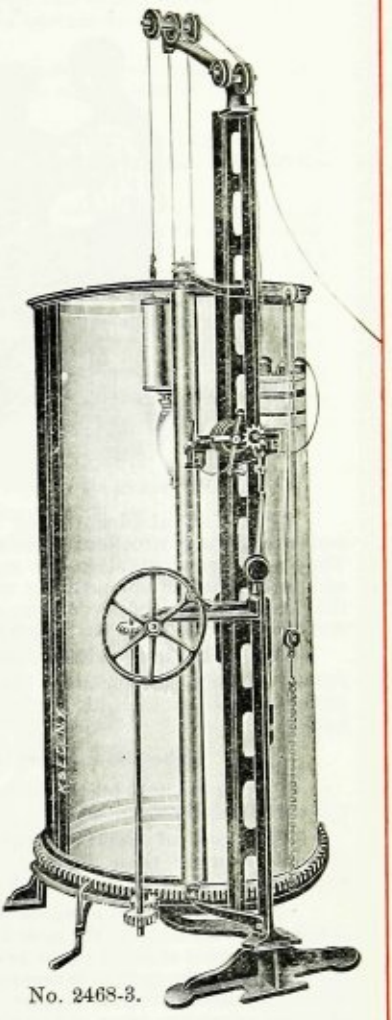
Tracing and paper are placed on the outer surface of the glass, where they are held by a canvas curtain mounted on a vertical roller attached to the upright, which carries also the lamp and the mechanism controlling it. This curtain is wound on to the cylinder by rotating the cylinder on its base by a conveniently placed handwheel. The rotating of the cylinder therefore automatically winds the curtain on to it and holds the tracings and paper in perfect contact. The feeding-in of the tracings and paper is more easily and quickly accomplished than on a tilting glass cylinder. The unwinding of the curtain is done by means of the handwheel.

The very efficient lamp is of a special pattern to give perfect diffusion and distribution of light. It can be set to any required speed, to any distance of travel, and to start from and stop at any point. The current is cut off automatically at the end of the travel of the lamp.

This is a very economical apparatus because it requires only one lamp, even for large tracings, and no current passes except while the lamp is printing. Tracings and paper can be inserted and removed very quickly and conveniently. It is much less liable to accidental breakage than the similar cylinders which swing in pivots and are placed horizontal to load them. Besides it requires much less floor space.

These frames can be furnished with lamps for either direct or alternating current, 110 or 220 volts.

They are all complete, ready to connect with the feed wire and can be furnished from stock at short notice.



No. 2468-3.

Old No.			
249 V.	2468-1. Frame complete with lamp, with two printing surfaces, each 42 × 36 in.		$245 00
	2468-2. " " " " " 42 × 48 "		270 00
	2468-3. " " " " " 42 × 60 "		290 00
	2468-4. " " " " " 42 × 72 "		350 00

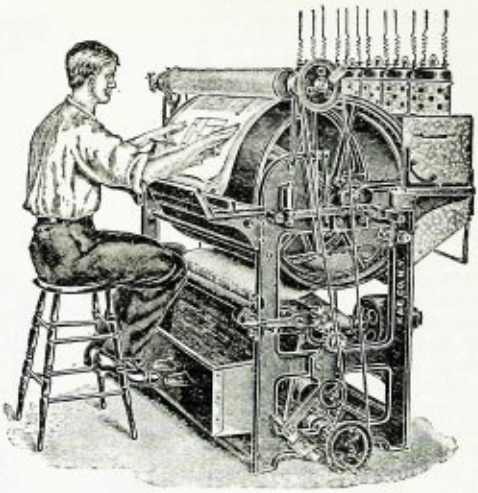
These prices include packing for shipment. The two semi-cylindrical glasses are packed each in a separate case, by an expert glass-packer. We are not responsible for breakage of glass in transit, but can insure it within the U. S. at 5% of its value.

In ordering, please state voltage and kind of current.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these frames from our Branches.

FEDERAL BLUEPRINTING MACHINE.

Patented.



No. 2470-2

The Federal Blueprinting Machines have many points of superiority and are giving excellent satisfaction during years of use in busy offices. They are beyond question the most economical, quickest, most convenient, and most durable blueprinting machines on the market and so simple that they can be operated by a boy, as they are practically automatic. **Detailed description and directions for using furnished on request.**

Old Nos.

We make three sizes of this machine, to print up to 30, 42, 54 in. wide:

Old Nos.			
249-30	2470-1.	Federal Blueprinting Machine, 30 in., 4 lamps	$450 00
249-42	2470-2.	" " " 42 " 6 "	525 00
249-54	2470-3.	" " " 54 " 8 "	600 00

The above prices include packing for shipment.

The price includes the motor and the complete lamps, which are for a 110-volt direct current.

The cost of electrical equipment for machines used with alternating current is more than for the direct current; prices will be quoted on application. Full particulars should be given as to voltage and frequency.

The Federal Blueprinting Machine makes **continuous** prints by electric light nearly as fast as they are made by the most favorable sunlight. The time of exposure is regulated by the speed of travel of the prints and can be changed instantly by the shifting of a lever, while the machine is running. It is therefore not necessary that the successive tracings be alike in printing qualities. There is no adjusting of the lamp for each kind of tracing or printing paper, and no plate glass to require frequent replacing. The light is utilized completely for printing, none of it diffusing into space. For prints narrower than the capacity of the machine, the superfluous lamps can be cut out.

The most suitable speed for printing is 4 to 5 lineal feet per minute, but it can be increased to 7 feet per minute with suitable tracings and paper.

The prints, after exposure, are passed into a box under the drum, and the apron, having passed between the pulling rolls, is taken up automatically by another roll underneath. When the end of the apron is reached it is readily wound back on its original roll by a multiplying gearing operated by hand.

For the apron we employ tracing cloth in rolls of 24 yards, but can furnish also rolls of 48 yards. It is very transparent when held under proper tension in close contact with the drawings and impedes light nearly as little as plate glass would. It has the advantage over celluloid that it can be readily replaced if that should become necessary, that its surface is not as easily dulled and that it can be brought much closer to the lamps because it is not inflammable.

The lamps are placed but 5 inches from the tracing cloth apron, which materially adds to the intensity and effectiveness of the illumination and permits of printing at a greater speed, and economy of current.

The speed of travel of the machine can be instantly regulated to suit the various tracings by means of a patent **speed-controller,** the change being made while the machine is running, by simply moving a lever to different notches on a sector.

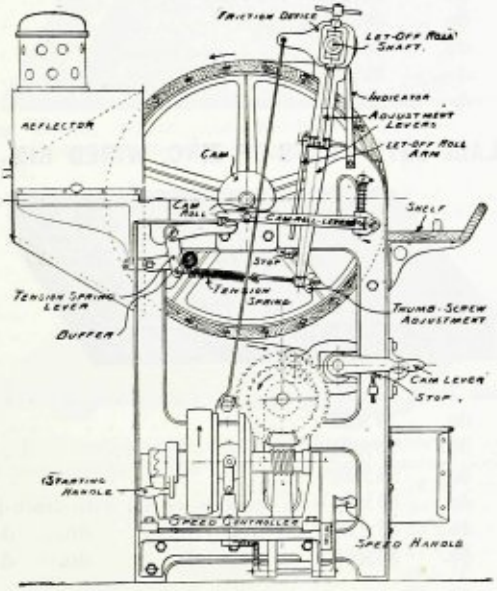
The work is fed and discharged on the same side of the machine, which saves much time, and is of the greatest possible advantage to the operator, as he is able at all times to examine the prints coming from the exposing chamber and to vary the speed of travel accordingly, without moving from his position at the feeding side of the machine.

A small motor of ¼ H. P. is used for power, or a belt may be connected from an over-head shaft to the controller if the machine is placed in a room provided with power.

As a time-saver the Federal Blueprinting Machine is far ahead of all others, as it prints in one-quarter to one-half of the time usually required by other styles of apparatus.

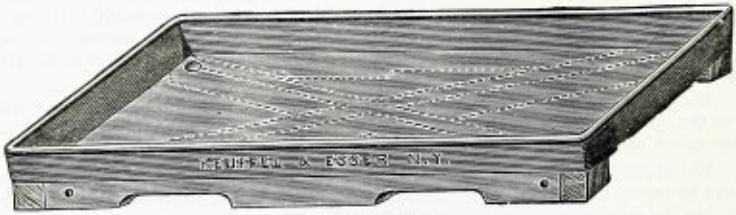
DIMENSIONS:

The height of the machine from floor to top of lamps is 4 ft. 10 in.
The 30-inch machine requires a floor space of 4 ft. by 4 " 6 "
" 42 " " " " " " " 6 " " 4 " 6 "
" 54 " " " " " " " 7 " " 4 " 6 "



SIDE ELEVATION
FEDERAL ELECTRIC BLUE PRINTING MACHINE.

SUPERIOR QUALITY ZINC BATH TRAYS.



No. 2480 H.

WITH DRAIN-PIPE, STRONG WIRED RIM AND HARDWOOD BRACES.

PLAIN. For water bath.

Old Nos.						
246.	2480 E.	Zinc Bath Tray	20×24 in	ea.	$	5 00
247.	2480 G.	do.	do.	24×30 "	"	6 25
248.	2480 H.	do.	do.	30×42 "	"	8 75
248-1.	2480 L.	do.	do.	36×48 "	"	11 00
249.	2480 M.	do.	do.	36×60 "	"	12 50
249-1.	2480 O.	do.	do.	42×60 "	"	15 00
249-2.	2480 P.	do.	do.	42×72 "	"	17 75

ASPHALTED. For chemical bath.

246 D.	2481 E.	Zinc Bath Tray,	20×24 in	ea.	$	5 00
247 D.	2481 G.	do.	do.	24×30 "	"	6 25
248 D.	2481 H.	do.	do.	30×42 "	"	8 75
248-1 D.	2481 L.	do.	do.	36×48 "	"	11 00
249 D.	2481 M.	do.	do.	36×60 "	"	12 50
249-1 D.	2481 O.	do.	do.	42×60 "	"	15 00
249-2 D.	2481 P.	do.	do.	42×72 "	"	17 75

PLAIN BATH TRAYS OF ZINC, WIRED RIM.



No. 2484 E.

Old Nos.						
244 S.	2484 A.	Plain Bath Tray,	12×17 in	ea.	$	2 00
245 S.	2484 C.	do.	do.	17×22 "	"	2 50
246 S.	2484 E.	do.	do.	20×24 "	"	3 50
47 S.	2484 G.	do.	do.	24×30 "	"	5 00
248 S.	2484 H.	do.	do.	30×42 " on wooden cross, with drain-pipe	"	8 00
248-1 S.	2484 L.	do.	do.	36×48 " do. do. do. do.	"	10 25
249 S.	2484 M.	do.	do.	36×60 " do. do. do. do.	"	12 00

The prices of bath trays cover crating for shipment.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these trays from our branches

K. & E. CO. DRAWING BOARDS.

K. & E. Co. Drawing Boards are the best that can be produced. They are of thoroughly seasoned, selected, narrow strips of white pine, and have a light coat of shellac. If wanted natural finish, this must be stated in the order.

Boards can be made for much less money, if other than thoroughly seasoned woods are employed, the material is less carefully selected and matched, and less attention is paid to workmanship and finish.

No. 2500. 2505.



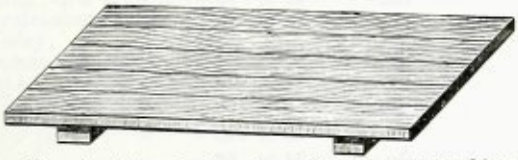


2500.	Drawing Board, white pine with end ledges of pine, clamped,		12 × 17 in.	each	$ 70
2501.	do.	do.	16 × 21 "	"	1 00
2502.	do.	do.	20 × 26 "	"	1 30
2505.	Drawing Board, white pine, with end ledges of pine, both sides presenting drawing surfaces,		12 × 17 in.	each	$ 70
2506.	do.	do.	16 × 21 "	"	1 00
2507.	do.	do.	20 × 26 "	"	1 30
2508.	do.	do.	23 × 31 "	"	1 80
2509.	do.	do.	27 × 34 "	"	3 00
2510.	do.	do.	31 × 42 "	"	4 00



No. 2512.
Patented.

2512.	Drawing Board, white pine, hardwood ledges attached by patent adjustable metal clamps, to allow contraction or expansion,		23 × 31 in.	each	$ 3 00
2513.	do.	do.	27 × 34 "	"	3 75
2514.	do.	do.	31 × 42 "	"	4 75
2515.	do.	do.	33 × 55 "	"	8 00
2516.	do.	do.	36 × 60 "	"	9 50

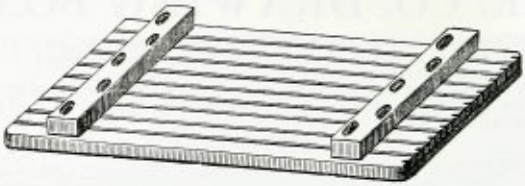


No. 2520.

2520.	Drawing Board, white pine, hardwood ledges attached by screws sunk in slots bushed with metal, to allow contraction or expansion,		16×21 in.	each	$ 1 50
2521.	do.	do.	20×26 "	"	2 20
2522.	do.	do.	23×31 "	"	3 25
2523.	do.	do.	31×42 "	"	5 25
2524.	do.	do.	33×55 "	"	8 50
2525.	do.	do.	36×60 "	"	10 00

The above prices cover crating for shipment.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these boards from our Branches.



No. 2530.

2530.	Drawing Board, white pine, hardwood ledges,				16 × 21 in.	each	$ 2 50
2531.	do.	"	"	"	20 × 26 "	"	3 20
2532.	do.	"	"	"	23 × 31 "	"	4 00
2533.	do.	"	"	"	31 × 42 "	"	6 50
2534.	do.	"	"	"	33 × 55 "	"	10 00
2535.	do.	"	"	"	36 × 60 "	"	12 00

The Drawing Boards No. 2530 to 2535 possess all the qualities a good and true board should have. They are of white pine, glued up to the required width, with the heart-side of each piece of wood to the surface. A pair of hardwood ledges is screwed to the back: the screws pass through the ledges in oblong slots with metal bushings, which fit closely under the heads and yet allow the screws to move freely when drawn by the contraction of the board. A series of grooves is sunk in half the thickness of the board on the under side. These grooves take the transverse strength out of the wood to allow it to be controlled by the ledges, leaving at the same time its longitudinal strength nearly unimpaired.

To make the working edge perfectly smooth, allowing easy movement of the T square, a slip of ebony is let into the end of the board. The slip is sawed apart at about every inch to allow for contraction of the board.

EXTRA LARGE DRAWING BOARDS.

These boards are of the best selected white pine with hardwood ledges and are the very best boards that can be made. We carry the more current sizes in stock; other sizes are made to order.

2538.	Pinewood Drawing Board,		36 × 72 in.	each.	$ 16 00
"	do.	do.	36 × 84 "	"	18 00
"	do.	do.	42 × 60 "	"	15 00
"	do.	do.	42 × 72 "	"	18 00
"	do.	do.	42 × 84 "	"	21 00
"	do.	do.	42 × 96 "	"	26 00
"	do.	do.	48 × 72 "	"	24 00
"	do.	do.	48 × 84 "	"	27 00
"	do.	do.	48 × 96 "	"	33 00
"	do.	do.	48 × 108 "	"	38 00
"	do.	do.	48 × 120 "	"	44 00
"	do.	do.	54 × 96 "	"	41 00
"	do.	do.	54 × 108 "	"	46 00
"	do.	do.	54 × 120 "	"	50 00
"	do.	do.	60 × 96 "	"	47 00
"	do.	do.	60 × 108 "	"	50 00
"	do.	do.	60 × 120 "	"	58 00

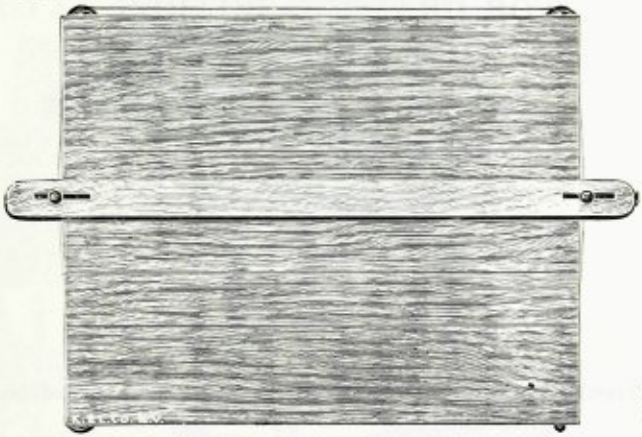
The above prices cover crating for shipment.

For Trestles and Horses for Boards see page 246.

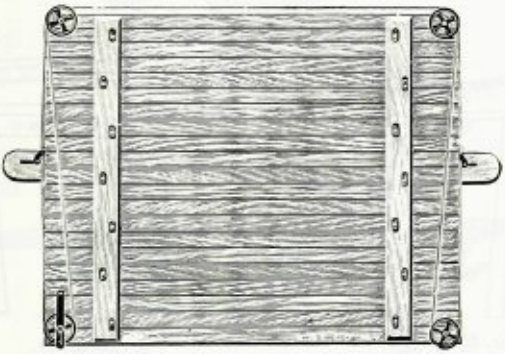
The prices on this page are f. o b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these boards from our Branches.

K & E PARALLEL ATTACHMENT

FOR DRAWING BOARDS AND TABLES.



No. 2549 B. (front)



No. 2549 A. (back)

Our improved parallel attachment insures absolutely parallel motion of the straightedge, which can be set to the horizontal or at an angle by releasing and tightening two thumbnuts. The hardwood straightedge can be easily removed by releasing two thumbnuts, when a **T** square can be used on the board in the usual way.

The fixtures consist of two double and two single pulleys, one of which is adjustable to regulate the tension, a best quality hardwood straightedge, with two metal clamps and the cord. They can be readily attached to any table or board having ledges underneath, without further directions than the above cut conveys.

2549 A.	**K & E** Parallel Attachment, for boards 26 in. . . . . each	$	3 60
2549 B.	" " " " " " 31 " . . . . . "		3 75
2549 C.	" " " " " " 42 " . . . . . "		4 20
2549 D.	" " " " " " 55 " . . . . . "		5 00
2549 E.	" " " " " " 60 " . . . . . "		5 25
2549 F.	" " " " " " 72 " . . . . . "		5 75
2549 G.	" " " " " " 84 " . . . . . "		6 75
2549 H.	" " " " " " 96 " . . . . . "		7 50
2549 I.	" " " " " " 108 " . . . . . "		8 00
2549 K	" " " " " " 120 " . . . . . "		9 50

TRESTLES AND HORSES
FOR DRAWING BOARDS.

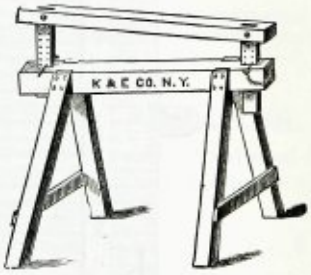


Wooden Trestles, made to order only. In ordering state size of board, to determine length and spread of trestle.



Copyright, 1887, by Keuffel & Esser.

No. 2552 C.



Copyright, 1890, by Keuffel & Esser Co.

2552 D.

Old Nos.			
2551-1.	2552 A.	Wooden Horses, light construction, 37 in. high, 35 in. long . . . . . per pair	$ 3 25
2551-2.	2552 B.	do. do. like No. 2552 A, fine quality, 37 in. high, 35 in. long . . . . . " "	5 50
2551.	2552 C.	do. do. fine quality, with removable Sloping Ledges, 37 in. high, 35 in. long . . " "	6 00
2551-3	2552 D.	Adjustable Wooden Horses, best workmanship, 36 in. long, adjustable for height from 37 to 47 in. on level or slope . . . . . " "	7 50

The above prices cover crating for shipment.

The prices on this page are **f. o. b. New York.** Owing to the relatively high cost of transportation we must add transportation charges **when delivering these goods from our Branches.**



No. 2553.

2553. Folding Hardwood Trestle, 37 in. high, with Drawing board 31 × 42 in. each $ 16 00

2554. do. do. do. do. do. do. 33 × 55 in. " 20 00

The Drawing Board is made of selected white pine and hinged to the Trestle, on which it can be slanted by means of supports catching in toothplates. Board and Trestle fold up compactly.



No. 2554 N

2554N **Simplex** Drawing Table, 38 in. high, board 36 x 60 in. drawer with lock, 24 × 32 × 2½ in . . . . . each $ 22 00

The Simplex Drawing Table is substantially constructed and the top is a high grade drawing board made like No. 2516. This is a very rigid and durable table, also well adapted for the drafting room in technical schools.
Quotations on other sizes of these tables or on modifications in design promptly furnished.

K & E Parallel Ruling Attachment (page 245) can be applied to Simplex Drawing Table.

The above prices cover crating for shipment.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches

UNIQUE FOLDING TRESTLES

WITH DRAWING BOARD.



No. 2555.

2555.	Unique Trestle, Hardwood, fine Drawing Board	31 × 42 in., each	$ 11 00
2556.	" " " " " "	33 × 55 " "	14 50
2556½.	" " " " " "	36 × 60 " "	16 50
2557.	Unique Trestle, Pinewood, plain Drawing Board	23 × 31 " "	$ 7 75
2558.	" " " " " "	31 × 42 " "	9 00
2559.	" " " " " "	33 × 55 " "	12 00
2559½.	" " " " " "	36 × 60 " "	13 50

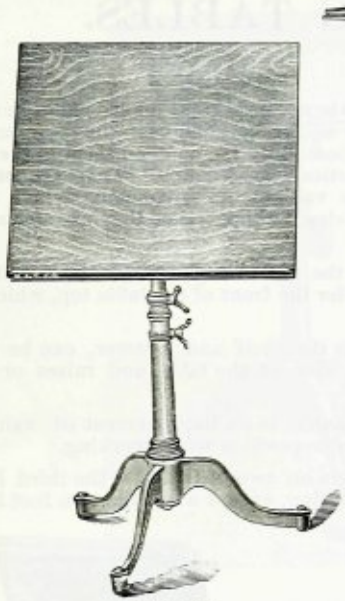
The Unique Folding Trestles combine simplicity of construction with great range of adjustment and firmness in any position. The range of adjustment is from 31 to 41 inches for height and from horizontal to about 45 degrees for slant of board. When folded, these trestles occupy but a few inches in thickness. The drawing boards on trestles 2555 to 2556½ are like No. 2512, etc.

K & E Parallel Ruling Attachment (page 245), can be applied to these boards.

The above prices cover crating for shipment.

The prices on this page are **f. o. b. New York.** Owing to the relatively high cost of transportation we must add transportation charges **when delivering these goods from our** Branches.

COLLEGE DRAWING TABLES.



No. 2560.



No. 2561 with Accessory T.S.

2560. College Drawing Table, ash top, 21x24 inches . . . . . each $ 8 50
2561. " " " " " 22x26 " . . . . . " 9 00

These tables are crated for shipment without extra charge.

ACCESSORIES FOR COLLEGE DRAWING TABLES.

T. S. Top shelf for No. 2561, 6½ in. wide, remaining horizontal at any inclination of the table top . . . . . extra each $ 1 25

D. S. Top shelf as above, but with two drawers . . . . . " " 2 50

Our College Drawing Tables possess all the features of an efficient and satisfactory

DRAWING STAND FOR THE CLASS ROOM.

The top is of ashwood, highly finished, and can be clamped horizontal or at any angle by a conveniently placed clamp, which locks it absolutely and rigidly. It is attached to a strong spindle, on which it can be rotated after releasing the clamping screw. There is a sliding collar with a clamp screw on the spindle, by clamping which the height of the table is regulated. The table stands 30 inches high and can be raised to 42 inches, and the top can be placed at any height within this range or at any inclination. The top shelf or ledge (see No. 2561 with T.S.) for drawing instruments, inks, etc., remains horizontal at any inclination of the table top.

FAVORITE DRAWING TABLES.

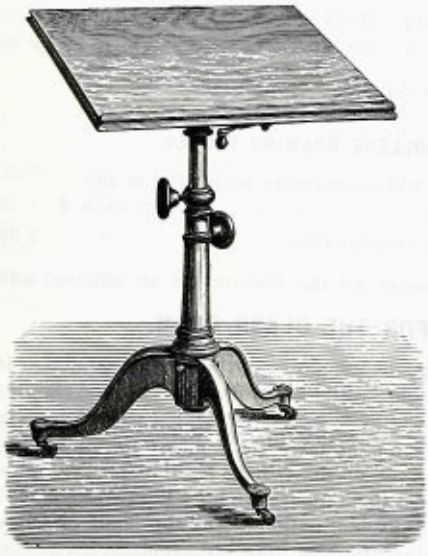
The Favorite Drawing Tables are in use in a great many offices and drafting rooms and in colleges and schools of the very highest standing, and they give such perfect satisfaction that we confidently recommend them as the best of all in material, workmanship and practical construction. They are **more rigid** and durable than any other and have valuable improvements which are not found on other tables. Owing to their elegant appearance they are also an ornament to any office, studio or library.

The adjusting and clamping of the top to any desired slant is done by shifting a lever conveniently placed under the front of the table top, which locks the clamp absolutely.

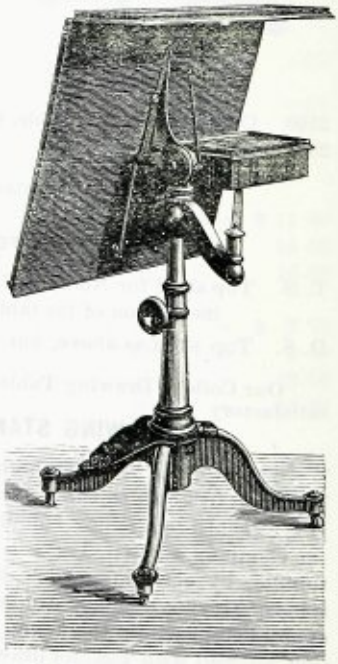
The jointed Bracket-arm, holding the Shelf and Drawer, can be readily moved to any desired point on either side of the table and raises or lowers with the table top.

The Iron Footrest, which is detachable, is an improvement of value, and is ornamental. It admits of a comfortable position while working.

The tables are provided with casters on two of the legs; the third leg has an iron foot to prevent the table from rolling, except when the iron foot is lifted off the floor.



No. 2570.



No 2571 with Accessories B. C. E.

FAVORITE DRAWING TABLES.



No. 2570.

2570.	Favorite Drawing Table, ash or oak Top 21 × 24 in. . . .	each	$	9 75
2571.	do. do. " " " " 22 × 26 " . . .	"		10 50
M.	Polished Mahogany Top	extra	"	2 25

ACCESSORIES

FURNISHED TO ORDER WITH FAVORITE DRAWING TABLES.

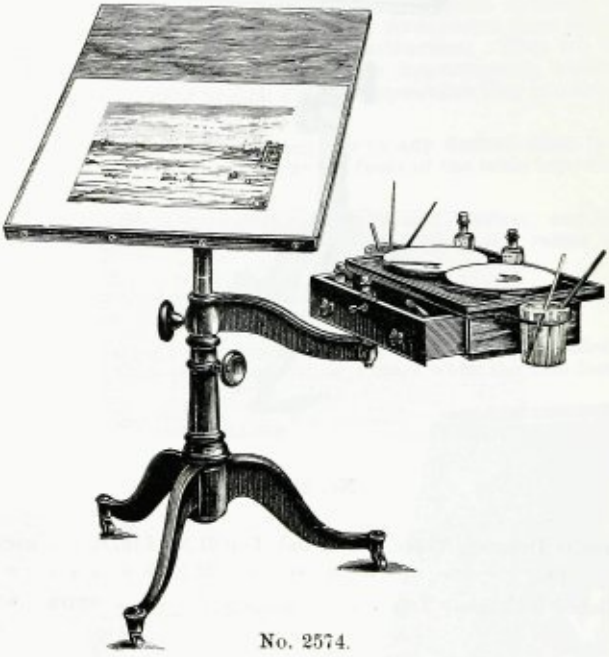
A.	Folding Arm with plain Shelf	each	$ 1 75
B.	do. " Shelf and Drawer with Lock . . .	"	2 75
C.	Detachable Iron Footrest, japanned	"	1 75
E.	Top Shelf, (without Drawers), for Tables No. 2571 & 2576	"	2 25
F.	do. (with two ") " " " 2571 & 2576	"	3 25
G.	Folding Arm with large Shelf, Drawer, etc. as shown with table No. 2574, on next page	"	4 25

These Tables are crated for shipment without extra charge.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches

FAVORITE DRAWING TABLE

SPECIALLY ADAPTED FOR WATER-COLOR PAINTING.



No. 2574.

2574. Favorite Drawing Table, ash or oak Top 21 × 26 in., Folding-Arm with large Shelf, Drawer with Lock, and two Holders for water-glasses . . . . . each $ 14 50

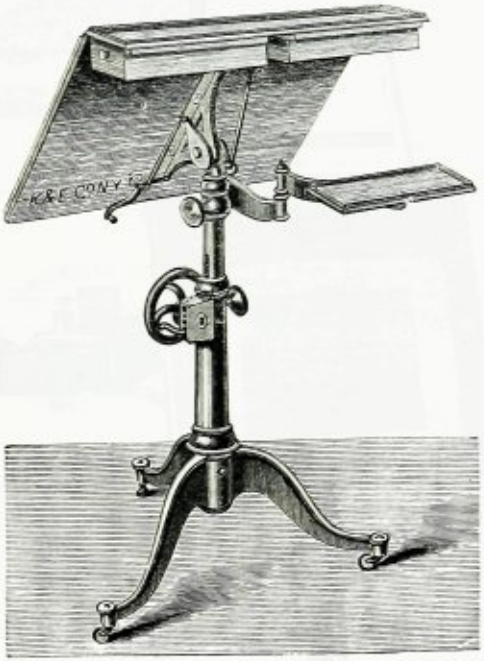
M. Polished Mahogany Top . . . . . extra " 2 25

For Accessories see page 251.

These Tables are crated for shipment without extra charge.

FAVORITE DRAWING TABLES.

These Tables have a Wheel-lift for raising and lowering the table top. It consists of a rack and pinion movement which is operated by a large hand-wheel and is so simple and easy to operate that a woman or child can handle it.



No. 2576 with Accessories. A. F. $ 18 50

2575.	Favorite Drawing Table, ash or oak Top 21 × 24 in. . . each	$ 13 00
2576.	do. do. " " " " 22 × 26 " . . "	13 50
M.	Polished Mahogany Top . . . . . extra "	2 25

For Accessories see page 251.

These Tables are crated for shipment without extra charge.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

FAVORITE DRAWING TABLES.

This Table has the Wheel-Lift for raising and lowering the table top, as described on opposite page. The Table can be converted into an Easel by setting the hinged lower edge of the table top at right angle, where it is held by catches. The rack for studies, shown in the cut, can be folded behind the table top when not in use.



No. 2578 with Accessories, B. C. $ 21.50

2578. Favorite Drawing Table, Polished Ash Top 26 × 26 in. each $ 17 00

FOR ACCESSORIES SEE PAGE 251.

These Tables are crated for shipment without extra charge.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

OFFICE FAVORITE DRAWING TABLES.

The top of these Tables is a fine white pine drawing board. On each of the two columns is a rack and pinion for raising and lowering the top and a patent clamping attachment for adjusting the slant. The two racks and pinions are operated by one wheel (Wheel-lift) and the two clamps for the table top are locked by one lever, the handle of which is at the front edge of the table. The footrest is of hardwood. These tables are of very fine quality and highly finished.



"Copyright, 1894, by Keuffel & Esser Co."

No. 2583 with Accessories R. T.

2582.	Office Drawing Table,	with	Drawing	Board	31 × 42 in.,	each	$	33 00
2583.	do.	do.	"	"	" 33 × 55 "	"		36 50
2583-1.	do.	do.	"	"	" 36 × 60 "	"		39 00
2583-2.	do.	do.	"	"	" 42 × 72 "	"		45 00

These Tables are crated for shipment without extra charge.

ACCESSORIES

FOR "OFFICE" DRAWING TABLE.

R.	Folding Arm with Shelf	each	$ 2 25
S.	Folding Arm with Shelf and Drawer with Lock	"	3 50
T.	Bracket with Hardwood Cabinet with 2 Drawers with Lock	"	5 50

T SQUARE AND GUIDE.

The T Square Guide is an iron bar, fastened to the left-hand side of the board, on which the specially constructed T Square moves freely, or is held at any point by a spring clamp. The T Squares have shifting head with clamping swivel.

2585.	T Square Guide,	with	T Square,	for board	31 × 42 in.	each	$	9 75
2586.	do.	do.	"	do.	" " 33 × 55 "	"		10 75
2586-1.	do.	do.	"	do.	" " 36 × 60 "	"		11 50
2586-2.	do.	do.	"	do.	" " 42 × 72 "	"		12 50

K & E Parallel Attachment (page 245) can be applied to these tables.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

CONSTRUCTOR'S FAVORITE DRAWING TABLES.

The Constructor's Drawing Tables are similar to the Office Tables described on the preceding page, and they have the same device for raising and lowering the top. The iron parts are nicely finished and painted in one color.

The top is a regular white pine drawing board, and can be inclined and clamped at any angle by a clamping rod connecting with both joints.



No. 2588.

2587.	Constructor's Drawing Table, board 31 × 42 inches . .	each	$ 28 00
2588.	" " " " 33 × 55 " . .	"	30 50
2588-1.	" " " " 36 × 60 " . .	"	32 50
2588-2.	" " " " 42 × 72 " . .	"	38 00

ACCESSORIES

FOR "CONSTRUCTOR'S" DRAWING TABLE.

P2.	Hardwood Footrest	each	$ 1 50
R2.	Folding Arm with Shelf	"	2 25
S2.	Folding Arm with Shelf and Drawer with Lock	"	3 50
T2.	Bracket with Hardwood Cabinet with Two Drawers with Lock	"	5 50

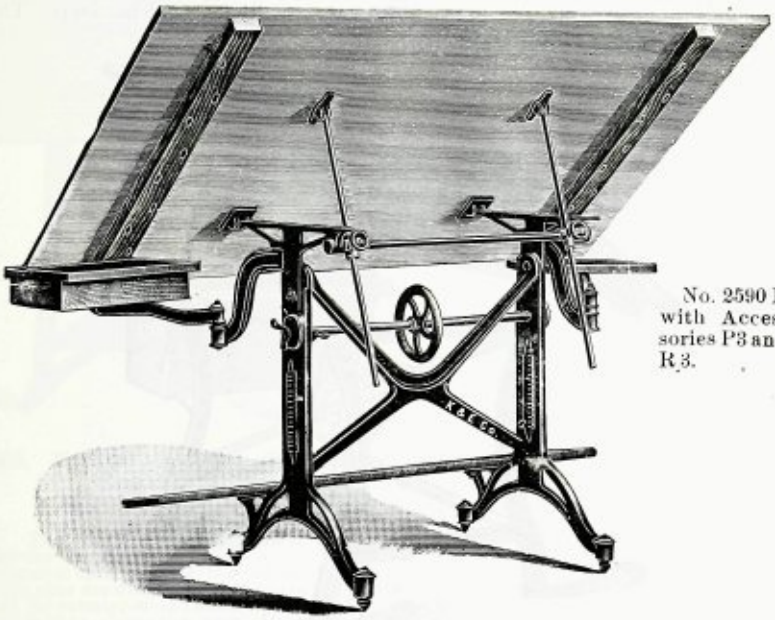
The **T Square and Guide** (page 255) and the **K & E Parallel Ruling Attachment** (page 245) can be applied to these tables.

These Tables are crated for shipment without extra charge.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

AMERICAN DRAWING TABLE.

The "American" is a very practical drawing table, rigid, substantial, capable of free adjustment, and durable. It is 36 in. high and can be raised to 48 in. by a rack and pinion in each of the two iron standards, operated by one large hand-wheel. The top is a white pine drawing board of fine quality, hinged to the standards. It can be slanted, up to the vertical, when it can be used as an upright board. It is held rigid by iron rods with clamp screws. The footboard is of hardwood.



No. 2590 E with Accessories P3 and R3.

2590 A.	American Drawing Table, board		31 × 42 in.	each	$ 27 00
2590 B.	do.	do.	33 × 55 "	"	30 50
2590 C.	do.	do.	36 × 60 "	"	32 50
2590 D.	do.	do.	36 × 72 "	"	37 50
2590 E.	do.	do.	42 × 72 "	"	40 00
2590 F.	do.	do.	42 × 84 "	"	43 00
2590 G.	do.	do.	42 × 96 "	"	48 00
2590 H.	do.	do.	48 × 72 "	"	46 00
2590 J.	do.	do.	48 × 84 "	"	49 00
2590 K.	do.	do.	48 × 96 "	"	56 00
2590 L.	do.	do.	48 × 108 "	"	60 00
2590 M.	do.	do.	48 × 120 "	"	67 00
2590 O.	do.	do.	54 × 120 "	"	74 00

These Tables are crated for shipment without extra charge.

ACCESSORIES FOR "AMERICAN" DRAWING TABLE.

P3.	Jointed Arm with plain shelf.	each	$ 2 25
R3.	" " " shelf and one Drawer with Lock . .	"	3 50

The T-SQUARE GUIDE described on page 255 or the K & E PARALLEL ATTACHMENT (page 245) can be applied to these tables.

The prices on this page are **f. o. b. New York.** Owing to the relatively high cost of transportation we must add transportation charges **when delivering these goods from our Branches.**

FULTON DRAWING TABLE.

The Fulton Drawing Table is a substantial iron drawing table of moderate cost. It is adjustable, is rigid in any position and is well made and finished. The top, which is a white pine drawing board is attached by four hinged iron rods, by means of which it can be raised from 32 up to 40 inches and slanted. The supporting rods are held by clamp screws.

The hardwood cabinet (T 3) has 2 drawers, 10×25 in. × 4¼ in. deep. The top of the cabinet constitutes a shelf.



No. 2591 A. with Cabinet T 3.

2591 A.	Fulton Drawing Table,	board 31 × 42 in	. . . . .	each	$ 22 00
2591 B.	do.	do.	" 33 × 55 "	. . . . .	" 24 50
2591 C.	do.	do.	" 36 × 60 "	. . . . .	" 27 00
2591 D.	do.	do.	" 36 × 72 "	. . . . .	" 31 00
2591 E.	do.	do.	" 42 × 72 "	. . . . .	" 33 00

These Tables are crated for shipment without extra charge.

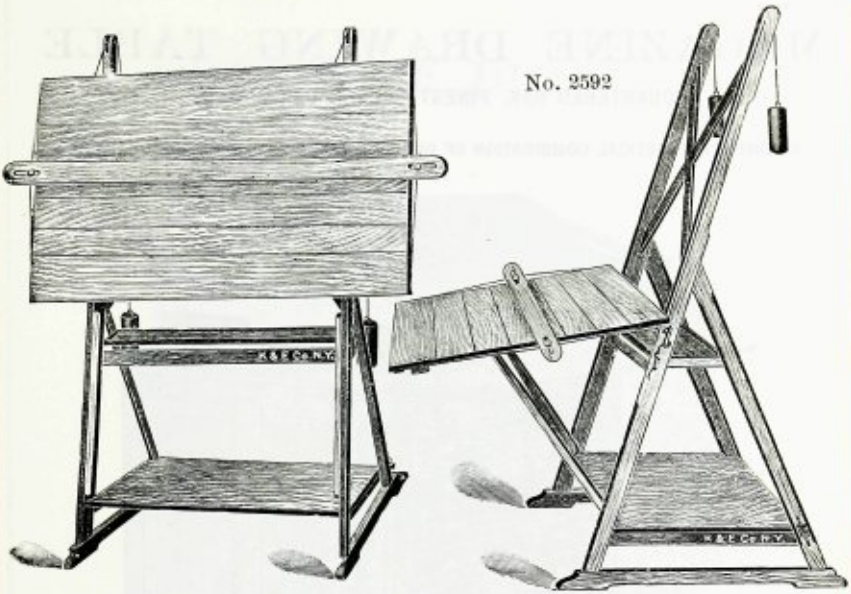
ACCESSORY.

T 3. Hardwood Cabinet with 2 drawers 10 × 25 × 4½ in. deep; top of cabinet constitutes a shelf . . . . . each $ 7 00

The T-SQUARE GUIDE described on page 255 or the K & E PARALLEL ATTACHMENT (page 245) can be applied to these tables.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

VERTICAL DRAWING TABLE.



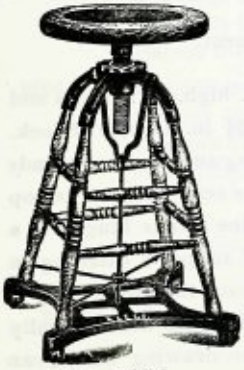
No. 2592

Old Nos.

2595. 2592. Vertical Drawing Table, hardwood, with fine Drawing Board of white pine 33×55 in. with K & E Parallel Attachment. (see page 245.) . . . . . each $ 35 00

The Vertical Drawing Table is of light but rigid construction, and so arranged that the drawing board can also be placed flat at table height, where it is held by an automatic catch and folding braces. The rigid hardwood frame, 6 ft. high, supports a fine white pine drawing board, 33 x 55 in. by metal cleats sliding in grooves in the frame and held by counter-weights suspended over rollers. At its highest vertical position its lower edge is 38 in. above the floor. It has the K & E Parallel Attachment and Straightedge (page 245). There is a sliding shelf 11 x 36 in. for tools and instruments, at mid-height of the frame and a larger shelf below which serves also as a footrest.

DRAFTSMEN'S STOOLS



No. 2593-2.

These stools are of practical construction and especially designed for the requirements of the draftsman. They are of good quality and firmly mounted on iron base, with casters, to allow them to be easily moved along the drawing board.

Old Nos.

2596 A. 2593-1. Draftsman's Stool, cane seat, 20½ in. each $4 50

2596 B. 2593-2. do. do. . . . . 26½ " " 4 75

2596 C. 2593-3. do. do. . . . . 32½ " " 5 15

2597 A. 2593-4. do. do. swiveling cane seat with screw; raising of seat independent of swiveling device, 22½ in. . . . . each $8 00

2597 B. 2593-5. do. do. 26½ " . . . . . " 8 25

2597 C. 2593-6. do. do. 32½ " . . . . . " 8 65

The above prices cover crating for shipment.

The prices on this page are **f. o. b. New York.** Owing to the relatively high cost of transportation we must add transportation charges **when delivering these goods from our Branches.**

MAGAZINE DRAWING TABLE

QUARTERED OAK, FINEST GOLDEN OAK FINISH.

A COMPACT, PRACTICAL COMBINATION OF DRAWING TABLE AND CHEST OF DRAWERS.



No. 2594

Old No.

2559-5. 2594. Magazine Drawing Table, **quartered oak**, finest golden oak finish . . . . . each $ 60 00

The price covers crating for shipment.

This combined Chest and Drawing Table is 35 in. high. The sides and back of the chest are paneled. 7 drawers 31 × 42 in., 2½ in. deep, with lock. The bottoms of the drawers are paneled to avoid warping and their rear ends have a narrow cover to prevent papers working over the rear ends. The top is a fine drawing board 35 × 48 in., of selected white pine and is hinged to a sliding frame, on which it can be slanted by means of supports catching in tooth plates. This sliding frame can be moved out beyond the front edge of the chest (as shown in cut) where it is held by a catch engaging automatically in a rack. The spaces on the top of the table, under the drawing board, can be used for tools, etc.

CHESTS OF DRAWERS.



No. 2596.

Old Nos.

2559 A. **2595.** Chest of Drawers, **quartered oak, paneled, finest golden oak finish,** 34 in. high, top 35 × 48 in., 7 drawers 31 × 42 in., 2½ in. deep with guard across rear end to prevent papers from working out, drawers with lock . . . . . each $ 48 00

2559 N. **2596.** Chest of Drawers, **hardwood, paneled, antique oak finish** similar to No. 2595, 33 in. high, top 35 × 48 in., 8 drawers 31 × 42 in., 2¾ in. deep with guard across rear end to prevent papers from working out. (no lock) . . " 35 00

The above prices cover crating for shipment.

Chests of Drawers of other dimensions or design made to order from drawings and specifications.

CHESTS OF DRAWERS, IN SECTIONS

QUARTERED OAK, FINEST GOLDEN OAK FINISH.



No. 2597.
B.B.D.E.
$58 00



Top, Regular Section and Base, 2597 D. B. E.

Special Section, 2597 C.

Old Nos.			
2559 B.	2597 B.	Regular Section of 4 Drawers . . . . . each	$24 00
2559 C.	2597 C.	Special Section, 6 Drawers and 3 Compartments . . . . "	29 00
2559 D.	2597 D.	Polished Hardwood Top, ... "	6 00
2559 E.	2597 E.	" " Base, ... "	4 00
	2597 F.	" " Sanitary Base (similar to 2598-F. p. 263) "	6 50

The above prices cover crating for shipment.

These Sectional Chests, consisting of base, sections and top, admit of arbitrarily changing the capacity of the composite chest, somewhat like the well-known sectional book cases can be changed. They are of quartered oak, golden oak finish and of very best workmanship.

The Regular Sections (B) consist of 4 drawers, 31 x 42 x 2½ in. deep. They are simultaneously locked or unlocked by an ingenious device. We make a Special Section (C) affording room for storing rolls of paper or cloth. It contains 4 drawers, 15½ x 20 x 2½ in. inside, 2 drawers, 15½ x 42 x 2½ in. inside, and 3 full length compartments for rolls of paper, etc., as shown in diagram. The spaces for roll paper have a door with spring catch at each end so that they are accessible from either side. A chest consisting of two sections with base and top is 36 in. high. The top measures 35 x 48 in.

The rear ends of the drawers have a guard to prevent papers working over the end.

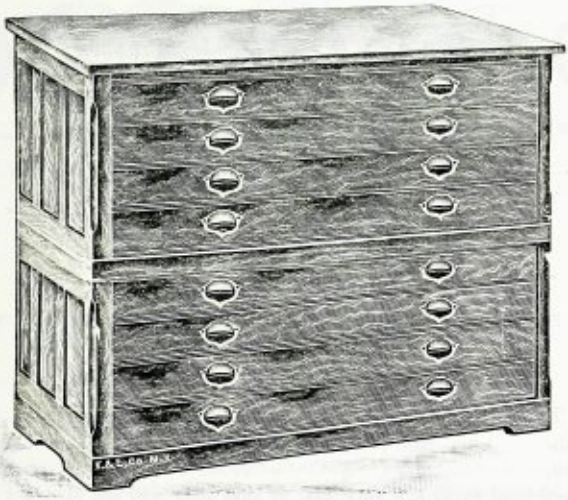
CHESTS OF DRAWERS IN SECTIONS

of other sizes, for storing drawings, tracings and papers, made to order. When writing for estimates please give all particulars, such as dimensions of chest, number and depth of drawers, kind and finish of wood, whether drawers are to be on rollers, with lock, &c., &c.

The prices on this page are f. o. b. New York. Owing to the relatively high cost of transportation we must add transportation charges when delivering these goods from our Branches.

CHESTS OF DRAWERS IN SECTIONS

HARDWOOD, ANTIQUE OAK FINISH.



No. 2598
B.B.D.E.
$48 00.



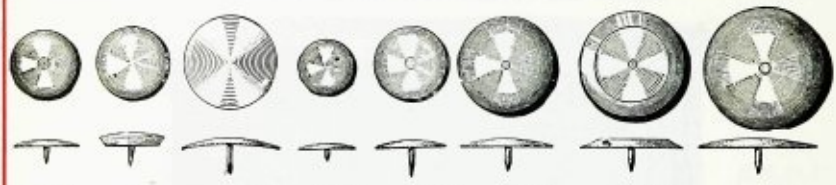
No. 2598 B. D. F. (Sanitary Base). $30 50

2598 B.	Regular Section of 4 Drawers	each	$ 20 00
2598 D.	Polished Hardwood Top	"	5 00
2598 E.	" " Base (similar to 2597-E, page 262) .	"	3 00
2598 F.	" " Sanitary Base, 17 in. high (see cut) .	"	5 50

The above prices cover crating for shipment

These Sectional Chests, consisting of base, sections and top, admit of arbitrarily changing the capacity of the composite chest, somewhat like the well-known sectional book cases can be changed. They are thoroughly well made, of **hardwood, antique oak finish.** A section consists of 4 drawers 31×42 in., $3\frac{1}{8}$ in. deep with guard across rear end to prevent papers from working out (no lock). A section is $16\frac{1}{2}$ in. high. The top measures 35 × 48 in.

DRAWING PINS OR THUMB TACKS.



2600. 2601. 2614. 2621. 2642. 2624. 2635. 2626.

STEEL TACKS.

HEAD AND POINT ONE PIECE.

2600. Solid Steel Tacks, fine, $\frac{5}{16}$ in. diam. (one doz. on a card) . doz. $ 80
2601. do. $\frac{5}{16}$ in. diam. (not mounted) . . . . . " 20

STEEL POINTS SWAGED. ONE DOZEN ON A CARD.

2612. Steel Tacks, Round head, $\frac{3}{8}$ in. diam. . . . . doz. $ 10
2614. do. do. $\frac{1}{2}$ " " . . . . . " 12
2616. do. do. $\frac{5}{8}$ " " . . . . . " 15

These steel-head tacks are very flat, so that they will not obstruct the T square. They are good durable tacks, and their points will not come through.

FINE GERMAN SILVER TACKS.

STEEL POINTS SCREWED IN AND RIVETED. ONE DOZEN ON A CARD.

Round Head.

2621. $\frac{5}{16}$ in., diam. . . . . doz. $ 50
2622. $\frac{3}{8}$ " " . . . . " 60
2623. $\frac{7}{16}$ " " . . . . " 65
2624. $\frac{1}{2}$ " " . . . . " 70
2625. $\frac{9}{16}$ " " . . . . " 80
2626. $\frac{5}{8}$ " " . . . . " 90

Beveled Head.

2632. $\frac{3}{8}$ in., diam. . . . . doz. $ 60
2633. $\frac{7}{16}$ " " . . . . " 65
2634. $\frac{1}{2}$ " " . . . . " 70
2635. $\frac{9}{16}$ " " . . . . " 80
2636. $\frac{5}{8}$ " " . . . . " 90

GERMAN SILVER TACKS.

STEEL POINTS SWAGED ONE DOZEN ON A CARD.

Round Head.

2642. $\frac{3}{8}$ in., diam. . . . . doz. $ 25
2644. $\frac{1}{2}$ " " . . . . " 30
2646. $\frac{5}{8}$ " " . . . . " 45

Beveled Head.

2652. $\frac{3}{8}$ in., diam. . . . . doz. $ 25
2654. $\frac{1}{2}$ " " . . . . " 30
2656. $\frac{5}{8}$ " " . . . . " 45

BRASS TACKS.

STEEL POINTS SWAGED. NOT MOUNTED.

Round Head.

2660. $\frac{1}{4}$ in., gross $ 80 doz. $ 10
2662. $\frac{3}{8}$ " " 1 60 " 15
2664. $\frac{1}{2}$ " " 2 40 " 25
2666. $\frac{5}{8}$ " " 3 80 " 35

Beveled Head.

2672. $\frac{3}{8}$ in., gross $ 1 60 doz. $ 15
2674. $\frac{1}{2}$ " " 2 40 " 25
2676. $\frac{5}{8}$ " " 3 80 " 35

STAMPED STEEL TACKS.



No. 2677 L. 2677. 2678. 2679.

PLAIN.

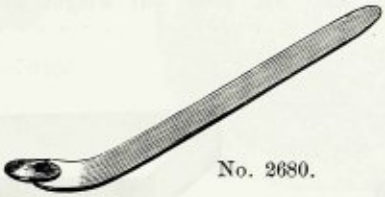
2677 L.	Stamped Tacks, $\frac{5}{32}$ in. diam.	per box of 100	$	45	card of 1 doz. $ 07
2677.	do. $\frac{3}{8}$ " "	" " " "		55	" " " " 08
2678.	do. $\frac{7}{16}$ " "	" " " "		65	" " " " 10
2679.	do. $\frac{9}{16}$ " "	" " " "		80	" " " " 12

NICKELPLATED.

2677 N.	Stamped Tacks, $\frac{5}{32}$ in. diam.	per box of 100	$	65	card of 1 doz. $ 10
2678 N.	do. $\frac{7}{16}$ " "	" " " "		80	" " " " 12
2679 N.	do. $\frac{9}{16}$ " "	" " " "		1 00	" " " " 15

These Stamped Steel Tacks are made of one piece of tough, hard steel (especially made for this purpose) and are of the very best quality. They have **needle finished points**, so that they make an excellent substitute for the regular thumb tacks, when it is desired to have a lower priced article.

TACK LIFTER.



No. 2680.

2680. Tacklifter and Paper Knife, Brass, Nickelplated, $5\frac{3}{4}$ in. . each $ 20

A handy and simple instrument for extracting thumb tacks. The end of the lifter is inserted under the head of the tack and takes it out without bending the point or wrenching off the head, as is often done by using a knife.

The handle of this instrument is a Paperknife, useful for removing drawings which have been glued to the board, etc.

(See also Lead Pencil File and Tacklifter page 295).

HORNCENTRES.



No. 2690 No. 2691.

2690. Horncentre, plain, $\frac{1}{2}$ in. diam. . . . . each $ 10
2691. do. with German silver rim, $\frac{3}{4}$ in. diam. . . . . " 50

PAPER CUTTERS.

Illustrations ⅔ size.



No. 2700.



2703.

2700.	Handy Paper Cutter, Brass	each	$ 35
2701.	do. do. Nickelplated	"	40
2703.	Safety Paper Cutter, "	"	75

These little instruments are of important service to Draftsmen, for cutting drawings from the board, also for cutting any kind of paper or Bristol board. They are slid along the ruler or T Square and will not injure its edge, as an ordinary knife would do. The blade of these Cutters can be adjusted to cut only the thickness of the paper without striking the drawing board. The knife of No. 2700 is set and clamped while the cutter of No. 2703 is adjustable by means of the thumbscrew projecting above the instrument. The knife can be removed from either instrument, for sharpening.

PAPER WEIGHTS.

2705.	Paper Weights, Shot in lined chamois bag, impervious to lead dust, a very practical paper weight about 2 pounds	each	$ 1 00
2706.	Paper Weights, like No. 2705, but weight about 3 pounds	"	1 25



No. 2707.



2710.

2707.	Paper weight and Ink-bottle Holder, iron, black enameled, weight about 2 pounds	each	$ 75

The bottle is inserted from below and secured by a bayonet flange; it will hold any of the drawing ink bottles generally used.

2710.	Lead Paper Weight, covered with leather, about $4 \times 2\frac{1}{4} \times \frac{3}{4}$ in., about $2\frac{3}{4}$ pounds, each		$ 80
2711.	do. do. $4\frac{1}{4} \times 2\frac{1}{2} \times 1$ " " $3\frac{3}{4}$ " "		1 00

No. 2715.



2716.



2715.	Iron Paper Weight, round, with knob, small,	each	$ 50
2716.	do. do. square, " " large,	"	75

These Iron Paper Weights are finely finished and cloth lined. The knobs are of polished hardwood.

ARKANSAS OIL STONES.

No. 2720.



2720.	Arkansas Oil Stone, in case with cover, about 3 in. . . .	each	$	75
2721.	do. do. " " " " " 5 " . . .	"	2	00
2725.	do. do. mounted on wood with handle, about 3 in.	"		50
2726.	do. do. " " " " " 4 in.	"		60
2727.	do. do. " " " " " 5 in.	"		75
2730.	do. do. Slips . . . . . each from $	25 to	$ 1	50

TECHNICAL (CONVENTIONAL) WATER COLORS.

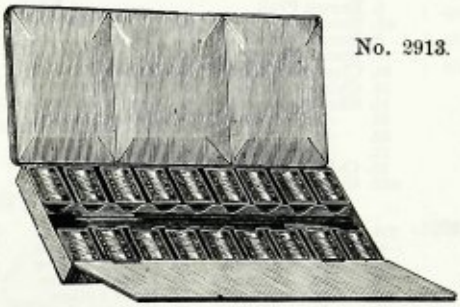


Full Pan.

No. 2900.



Half Pan.



No. 2913.

| | | | |

WINSOR & NEWTON'S

WATER COLORS.

Full Cake.





Full Pan.

Half Cake.





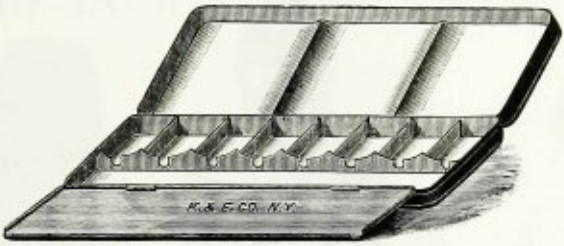
Half Pan.

					Cake or Pan. Full	Half
2920.	1. Antwerp Blue	15. Dragon's Blood	30. New Blue			
	2. Bistre	16. Emerald Green	31. Olive Green			
	3. Blue Black	17. Flake White	33. Payne's Grey			
	*4. British Ink	18. Gamboge	101. Permanent Blue			
	5. Brown Ochre	19. Hooker's Green, No. 1	34. Prussian Blue			
	6. Brown Pink	20. do. do. 2	35. do. Green			
	*7. Bronze	21. Indigo	36. Raw Sienna			
	8. Burnt Sienna	22. Indian Red	37. Raw Umber			
	9. Burnt Umber	23. Italian Pink	40. Roman Ochre			
	94. Charcoal Grey	24. Ivory Black	41. Sap Green.			
	10. Chinese White	25. King's Yellow	42. Terre Verte			
	14. Chrome, Deep	26. Lamp Black	43. Vandyke Brown			
	95. do. Lemon	27. Light Red	44. Venetian Red			
	32. do. Orange	†100. Mauve	45. Vermilion			
	11. do. Yellow	28. Naples Yellow	47. Yellow Lake			
	12. Cologne Earth	29. Neutral Tint	48. Yellow Ochre			
	*13. Constant White			each	$ 25	$ 15
2921.	114. Cadmium Lemon	89. Cerulean Blue	56. Purple Lake			
	96. Alizarin Crimson	52. Crimson Lake	57. Roman Sepia			
	102. do. Green	53. Indian Yellow	58. Ruben's Madder			
	103. do. Orange	106. Leitch's Blue	59. Scarlet Lake			
	104. do. Scarlet	54. Mars Yellow	60. do. Vermilion			
	105. do. Yellow	55. Neutral Orange	61. Sepia			
	*49. Black Lead	64. Orange Vermilion	62. Warm Sepia			
	50. Brown Madder			each	45	25
	51. Carmine Lake					
2922.	69. Cadmium Orange	87. Mars Orange	99. Permanent Violet			
	68. do. Yellow	†107. Emerald Oxide of Chrome	77. Pale Cadmium Yellow			
	63. Cobalt Blue	73. Oxide of Chromium	79. Pure Scarlet			
	97. do. Green	†108. do. Transparent	†109. Ultramarine Ash-Gray			
	71. French Blue	98. Permanent Mauve	65. Violet Carmine			
	74. Indian Purple		81. Viridian			
	75. Intense Blue			each	65	35
	76. Lemon Yellow					
2923.	66. Aureolin	110. Gallstone	112. Rose Dorée			
	91. Aurora Yellow	86. Madder Carmine	90. Scarlet Madder			
	67. Burnt Carmine	111. do. Lake,	80. Rose Madder			
	70. Carmine	78. Pink Madder	93. Yellow Carmine			
	85. Field's Orange Vermilion	92. Primrose Aureolin				
		82. Purple Madder		each	90	45
2924.	84. Ultramarine Ash Blue.			each	1 40	70
2925.	88. Genuine Ultramarine			½ Cake each	$ 2 25	

Colors marked * are made ONLY in CAKES, and those marked † ONLY in PANS.

EMPTY JAPANNED TIN BOXES

for Moist Colors in Pans.



No. 2951.

2950.	For 6 full or 12 half Pans	each $	80
2951.	" 8 " " 16 " "	"	90
2952.	" 9 " " 18 " "	"	1 00
2953.	" 10 " " 20 " "	"	1 05
2954.	" 12 " " 24 " "	"	1 15
2955.	" 16 " " 32 " "	"	1 30
2956.	" 18 " " 36 " "	"	1 40
2957.	" 20 " " 40 " "	"	1 45
2958.	" 24 " " 48 " "	"	1 60

These boxes are fitted for the moist colors listed on pages 267 and 268. Brushes are listed on pages 278 and following.

WINSOR & NEWTON'S WATER COLOR LIQUIDS.



No. 2961.

2960.	Chinese White	each $	30	2965.	Indelible Brown Ink,	each $	30
2961.	Indian Ink	"	30	2966.	Prout's Brown	"	30
2962.	Oxgall	"	30	2967.	Sepia	"	30
2963.	Gold Ink	"	30	2968.	Blue	"	30
2964.	Carmine	"	30				

HIGGINS' DRAWING INKS AND ADHESIVES.



No. 2970.

HIGGINS' DRAWING INKS.

2969.	Black, **Waterproof.**	2974.	Brick-red.	2979.	Brown.
2970.	" **General.**	2975.	Blue.	2980.	Yellow.
2971.	Carmine.	2976.	Green.	2981.	Orange.
2972.	Scarlet.	2977.	Violet.		
2973.	Vermilion.	2978.	Indigo.		

Small	(¾ oz.)	each	$ 25
Half Pints	(8 ")	"	2 00
Pints	(16 ")	"	3 75
Quarts	(32 ")	"	7 00



No. 2985.



2986.



2987.

2985. Higgins' Drawing Board Mucilage,

	3 oz.	6 oz.	14 oz.	Half-Gallon	Gallon.
each $	.15	.25	.50	2.00	3.50

2986. Higgins' Taurine Mucilage,

	2 oz.	4 oz.	½ pint	pint	quart
each $	.10	.20	.30	.50	.80

2987. Higgins' Office Paste,

	4 oz.	8 oz.
each $	.15	.25

COLUMBIA
LIQUID INDELIBLE DRAWING INKS.

Illustration about ½ size.



No. 3000.

Patented.





Improved Ink Filler

Columbia Indelible Drawing Ink,

3000.	Black	each $	25	3005.	Carmine	each $	25
3001.	Brown	"	25	3006.	Yellow	"	25
3002.	Blue	"	25	3007.	Vermilion	"	25
3003.	Green	"	25	3008.	Orange	"	25
3004.	Scarlet	"	25	3009.	Violet	"	25

Mailing charges (postage and regulation mailing box) . . . " 10

FOR LARGER SIZES SEE NEXT PAGE.

Columbia Indelible Inks meet the requirements of a perfect drawing ink and are always ready for use and always uniform in quality and color. They flow freely, dry readily, and are not apt to gum. They therefore possess all features to recommend them as an always reliable ink for general drafting. For extra black and extra dense ink we refer to our Kallos Ink, described on page 273.

All these Inks are indelible in that they will not re-dissolve after drying, a feature variously described as indelible, waterproof, washable, etc. Lines drawn with these inks will not blur nor be defaced by brush tints, even frequently applied, nor by exposure to moisture in out-door use.

The Colored Columbia Drawing Inks are all perfect of their kind, including the blue which is the most difficult color, and which has not been produced in perfection in any other ink. They all are freely miscible for producing other tints. They are put up in improved containers provided with a new patent ink filler. This consists of a glass tube with flattened capillary opening, which can be inserted *between* the blades of a drawing pen and is provided with a rubber bulb to fill it by suction and to feed by pneumatic pressure. The compressible bulb is enclosed in a rigid annular collar, which protects it during transportation and serves as a handle which prevents scattering of the ink and deflection of the tube from lateral pressure on the bulb when filling a pen. This device is so cleanly that it dispenses with wiping the pen after filling and hence requires no pen-wiper. There is no soiling of the pen or fingers (nor of the drawing), the glass-filler cannot become soft and flabby, like other material would, and there is *no waste of ink.* With other devices for filling pens, there is *more ink wasted than there is used;* with our filler there is *no* waste, making it the *most economical* as well as the most practical and cleanly.

For Holders for Columbia Ink, see No. 2707 page 266 and No. 3019, page 273.

COLUMBIA
LIQUID INDELIBLE DRAWING INKS

IN LARGE BOTTLES.

QUARTER-PINTS.

Black,	3000 C, .	$ 90
Brown,	3001 C, .	90
Blue,	3002 C, .	90
Green,	3003 C, .	90
Scarlet,	3004 C, .	90
Carmine,	3005 C, .	90
Yellow,	3006 C, .	90
Vermilion,	3007 C, .	90
Orange,	3008 C, .	90
Violet,	3009 C, .	90

HALF-PINTS.

Black,	3000 D, .	$1 60
Brown,	3001 D, .	1 60
Blue,	3002 D, .	1 60
Green,	3003 D, .	1 60
Scarlet,	3004 D, .	1 60
Carmine,	3005 D, .	1 60
Yellow,	3006 D, .	1 60
Vermilion,	3007 D,	1 60
Orange,	3008 D, .	1 60
Violet,	3009 D, .	1 60



PINTS.

Black,	3000 E, .	$3 00
Brown,	3001 E, .	3 00
Blue,	3002 E, .	3 00
Green,	3003 E, .	3 00
Scarlet,	3004 E, .	3 00
Carmine,	3005 E, .	3 00
Yellow,	3006 E, .	3 00
Vermilion,	3007 E, .	3 00
Orange,	3008 E, .	3 00
Violet,	3009 E, .	3 00

QUARTS.

Black,	3000 F, .	$5 75
Brown,	3001 F, .	5 75
Blue,	3002 F, .	5 75
Green,	3003 F, .	5 75
Scarlet,	3004 F, .	5 75
Carmine,	3005 F, .	5 75
Yellow,	3006 F, .	5 75
Vermilion,	3007 F, .	5 75
Orange,	3008 F, .	5 75
Violet,	3009 F, .	5 75

COLORED COLUMBIA INKS IN SETS.



No. 3010.

		set
3010.	Polished Mahogany Box, cont'g any 6 colors of Nos. 3000 to 3009,	$ 2 25
3011.	Plain Wooden Box, " " do. do. do. "	1 50

KALLOS LIQUID DRAWING INK.



Illustration about ⅓ size.

(Container Patented.)

3012. Kallos Indelible Drawing Ink, Black . . . . . each $ 25

Kallos Ink, black, is intended chiefly for vigorous tracings. It is dead-black and gives very dense lines. These features adapt it for drawing on tracing cloth, where it gives black uniform, unbroken lines. It does not flow quite as freely as the black Columbia Ink (page 271), which is therefore preferable for drawing on paper.

Kallos Ink is put up in improved patented bottles which permit of using the ink to the last drop. The improved shape of the bottle obviates the danger of upsetting it in withdrawing or inserting the filler, as the neck is oblique and in the line of the motion of the hand. The very practical filler, which is set into the stopper, is shaped like a barrel pen and will hold sufficient ink, and transfer it to the pen, without waste or soiling.

INK-BOTTLE HOLDER.



Illustration about ½ size.

No. 3019.

3019. Ink-bottle Holder, iron, weight about 8 oz., ... each $ 30

This holder is adapted for either Columbia Inks or Higgins'. The bottle is held by a steel spring inserted through one of the openings in the sides of the holder: for Columbia Inks through the opening marked **C**, for Higgins' through that marked **H**.

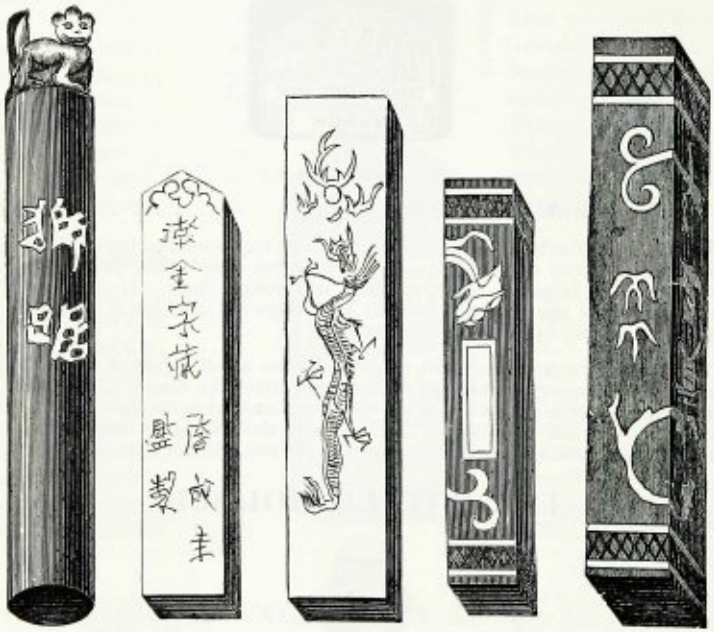
The holder is of iron, with a neat bronze finish and shaped to guard against tipping.

For Ink-bottle Holder (paperweight) see page 266.

CHINESE OR INDIAN INKS.

OUR DIRECT IMPORTATION.

Illustrations full size.



B. D. E. G. H.

3030.	A.	Oval, black with Lion Head	cake	$ 25
	B.	" " " " "	"	50
	D.	Oblong, gilt	"	40
	E.	" "	"	60
	F.	Square, black, gilt figures	"	30
	G.	" " " "	"	40
	H.	" " " "	"	75



J.

Illustrations full size.



N.



N-2.

3030. J. Oblong, black, blue and gilt figures . . . . . each $ 1 50

N. Square, black, gilt figures, Super Super . . . . . " 1 00

N-2. " " " " " " small . . . . " 50

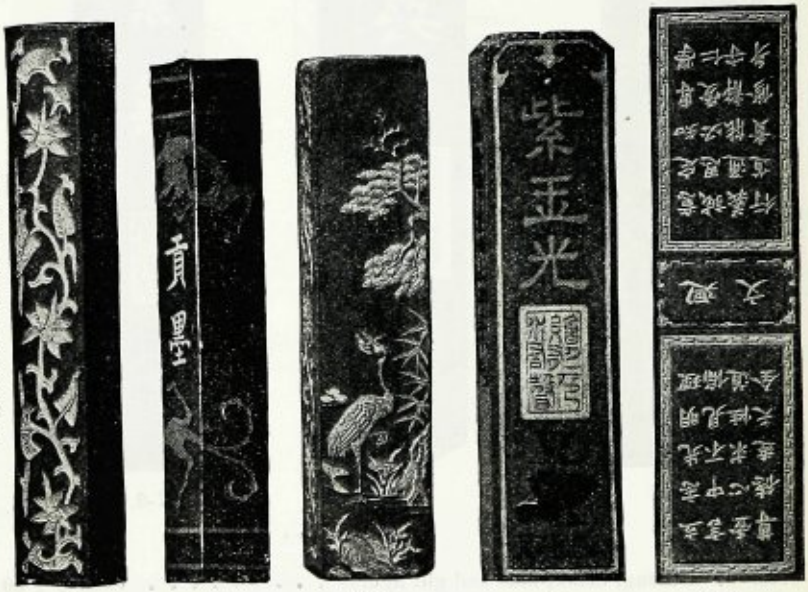
EXTRA FINE INDIA INKS.

TRADEMARK: K. & E. CO.

The inks No. 3031, I to XII are of extra-fine quality and the very finest that are made. As ALL the patterns of fine India inks are imitated in, cheap grades in China and are so minutely copied that it is practically impossible to tell the counterfeit from the genuine by inspection, we mark our extra fine inks with our trademark and initials. This enables the buyer to have our guaranty that the ink is the genuine, fine article and not an imitation.

We highly recommend these fine inks to Draftsmen and Artists.

"Copyright, 189[illegible], by Keuffel & Esser Co."



I. II. III. V. VI.

3031– I.	Oblong, black, 3 in. long	each	$	1 50
II.	" " 2¾ " "	"		1 50
III.	" " 2¾ " "	"		3 00
V.	" " 2⅛ " " with pearl	"		2 50
VI.	" " 3½ " "	"		3 00

EXTRA FINE INDIA INKS.

TRADEMARK: K. & E. CO.

"Copyright, 1894, by Keuffel & Esser Co."



VII.



VIII.



IX.



XII.

3031.	VII.	Oval, black,	$3\frac{3}{8}$ in. long	each	$ 4 00
	VIII.	Oblong, "	$3\frac{1}{2}$ " "	"	3 00
	IX	" "	$3\frac{3}{4}$ " "	"	4 50
	XII.	" "	$4\frac{1}{4}$ " "	"	6 00

BRUSHES.

As the quality of brushes can not be exactly described and as illustrations can not be made to show quality, we mention that all the brushes we list are the very best of their respective kind. They are always of the kind of hair mentioned, without adulteration or substitution, and each size contains the proper quantity of hair. The numbering of our brushes is the same now for the same sizes which we so numbered over 40 years ago.

Illustrations full size.



3100. Black Sable in Quills,

No.	1	2	3	4	5	6	7	8
each $	70	60	45	35	30	25	20	15

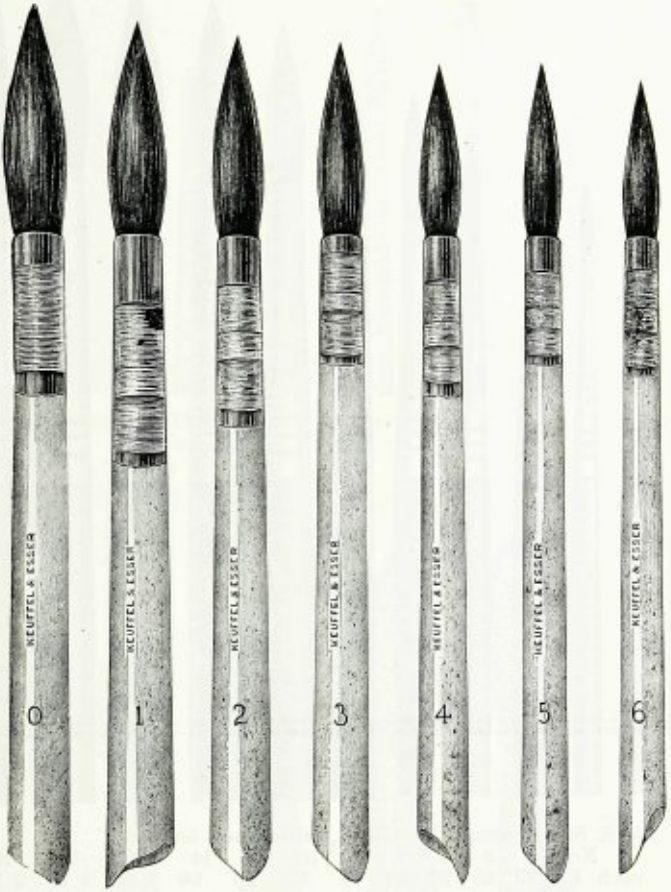
3101. Red Sable in Quills,

No.	1	2	3	4	5	6	7	8
each $	60	50	40	35	25	20	15	12

3102. Camel Hair in Quills,

No.	1	2	3	4	5	6	7	8
each $	10	10	08	08	06	06	05	05

Illustrations full size.



"Copyright, 1887, by Keuffel & Esser."

3110. Black Sable in Swan Quills,

No.	0	1	2	3	4	5	6
each	$ 3 30	2 80	2 10	1 50	1 00	80	70

3111. Red Sable in Swan Quills,

No.	0	1	2	3	4	5	6
each	$ 2 15	1 85	1 50	1 10	95	75	55

3112. Camel Hair in Swan Quills,

No.	0	1	2	3	4	5	6
each	$ 60	50	35	25	15	12	09

Illustrations full size.



"Copyright, 1897, by Keuffel & Esser."

3120. Black Sable, round, in Albata, with black handle,

No.	1	2	4	6	8	10	12	14	16	18	20	22
each $	20	25	30	35	45	55	70	90	1 25	1 75	2 35	3 15

3121. Red Sable, round, in Albata, with black handle,

No.	1	2	4	6	8	10	12	14	16	18	20	22
each $	13	15	20	30	40	55	75	95	1 20	1 45	1 90	2 40

Illustration ½ size.



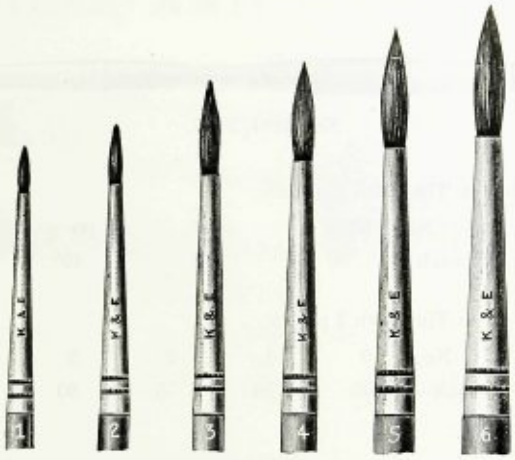
No. 3123.

3123. Red Sable, round, in Albata, with two points,

No.	1	2
each	$ 1 00	1 40

Please note that ours are **real sable** brushes. We emphasize this because sable hair, on account of the advances in its price has been extensively adulterated. Real sable brushes form a finer point and retain this point longer than others and **remain elastic.**

Illustrations full size.



Copyright, 1887, by Keuffel & Esser.

No. 3132.

3132. Camel Hair in Tin, with red handle,

No.	1	2	3	4	5	6
each $	07	08	08	10	10	12

Illustrations full size.



No. 3133.

3133. Camel Hair Sky or Wash Brush, in Tin, with polished handle,

No.	0	1	2	3
each $	20	25	30	35



No. 3134, 3135.

3134. Camel Hair in Tin, with 2 points,

No.	0000	000	00
each $	30	35	40

3135. Camel Hair in Tin, with 2 points,

No.	0	1	2	3
each $	45	50	55	60

Illustration full size.



"Copyright, 1887, by Keuffel & Esser."

No. 3136-3.

3136. Camel Hair Sky or Wash Brush, extra-fine, round, in Albata,

No.	1	2	3
each $	50	60	70

3137. Camel Hair Sky or Wash Brush, extra-fine, flat, in Albata,

No.	1	2	3
each $	50	60	70

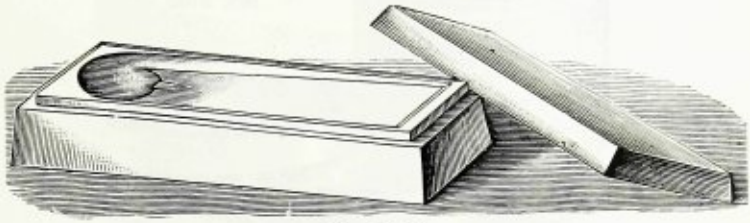


No. 3138.

3138. Camel Hair in Albata, with 2 flat points,

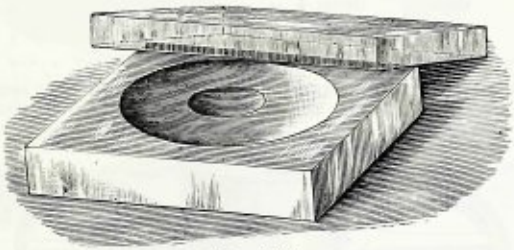
No.	1	2
each $	1 10	1 30

CHINA AND GLASSWARE.



No. 3150.

				Each
3150.	Keuffel & Esser Co.	Pat. Ink Slab, China, with cover,	$1\frac{3}{4}\times4\frac{1}{2}$ in.	$ 35
3151.	do.	do.	" " $2\frac{1}{8}\times5\frac{1}{4}$ "	40
3153.	do.	do.	**Slate** Slab, glass cover, $2\frac{1}{8}\times5\frac{1}{4}$ in.	80

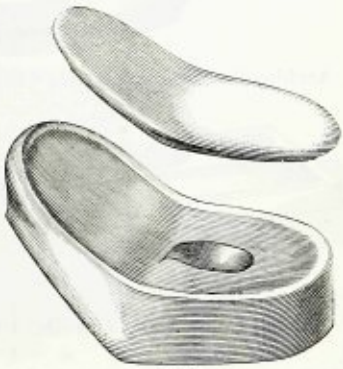


No. 3154.

3154. **Slate** Ink Cup, with glass cover, $3\frac{1}{2}\times3\frac{1}{2}$ in. . . . . each $ 35



No. 3156.



3158.

3156. Chinese Ink Cup, opal glass, $3\frac{1}{4}$ in. diam., with cover . . . each $ 50
3158. Poole's Patent Ink Slab, with cover . . . . . " 50

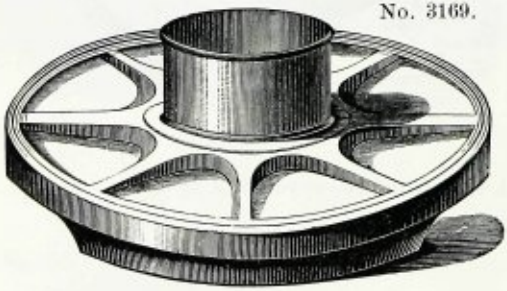


No. 3160.

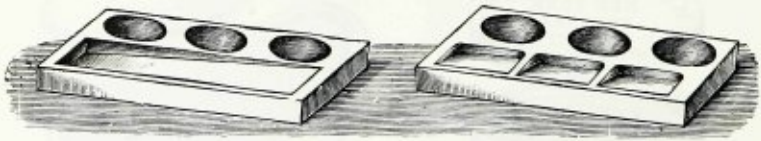
3160.	Nest of Cabinet Saucers,	6 in set,	$2\frac{3}{8}$ in.	set	$ 45
3161.	do.	6 " "	$2\frac{5}{8}$ "	"	55
3162.	do.	6 " "	$3\frac{1}{4}$ "	"	65
3163.	do.	6 " "	$3\frac{3}{4}$ "	"	75
3164.	do.	deep 4 " "	$2\frac{5}{8}$ "	"	70
3165.	do.	" 4 " "	$3\frac{1}{4}$ "	"	80
3166.	do.	" 4 " "	$3\frac{3}{4}$ "	"	90

A "Nest of 6" consists of 5 saucers and cover; a "Nest of 4" of 3 saucers and cover.

No. 3169.

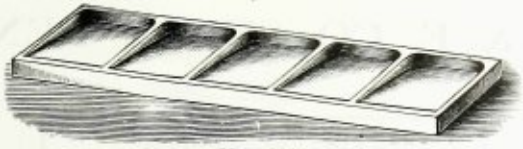


3169. Architect's Slant and Basin, 8 divisions and cup, 7 in. diam., each $ 1 35



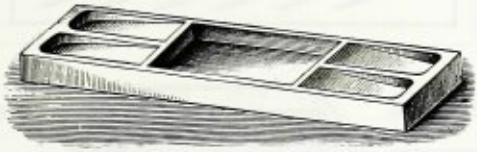
No. 3170. 3174.

3170.	Ink or Color Slab,	3 Wells,	1 Slope,	$1\frac{1}{2} \times 2\frac{3}{4}$ in.	each $ 10
3171.	do.	3 "	1 "	$2\frac{3}{8} \times 3\frac{5}{8}$ "	" 18
3172.	do.	3 "	1 "	$2\frac{3}{4} \times 4\frac{1}{4}$ "	" 25
3173.	do.	3 "	1 "	$3 \times 4\frac{1}{2}$ "	" 30
3174.	do.	3 "	3 Slopes,	$2\frac{1}{2} \times 4$ "	" 18
3175.	do.	5 "	5 "	$4 \times 7\frac{1}{2}$ "	" 55



No. 3178.

3176.	Sloping Tile, 3 divisions,			$2\frac{3}{4} \times 4$	in.	each $ 15
3177.	do.	4	"	$3\frac{1}{2} \times 7\frac{3}{4}$	"	" 30
3178.	do.	5	"	$3\frac{1}{2} \times 7\frac{3}{4}$	"	" 35
3179.	do.	6	"	$3\frac{1}{2} \times 7\frac{3}{4}$	"	" 40
3180.	do.	8	"	$6 \times 7\frac{5}{8}$	"	" 50
3181.	do.	10	"	$6 \times 7\frac{5}{8}$	"	" 55
3182.	do.	12	"	$6 \times 7\frac{5}{8}$	"	" 65



No. 3183.

3183. Centre Slab, 5 divisions, $2\frac{3}{4} \times 6$ in. . . . . each $ 20



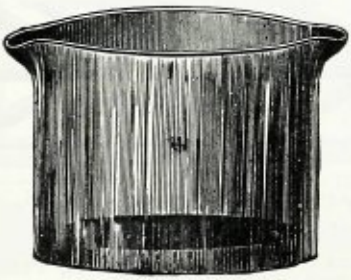
No. 3184.



3185.

3184.	China Color Cups,	$2\frac{1}{2}$	3	$3\frac{1}{2}$ in. diam.
	each $	07	10	20

3185. China Brush Rest, $5\frac{1}{2}$ in. long . . . . . each $ 15



No. 3186.

3186.	Artist's Water Glass,	$2\frac{3}{8}$	in. diam.	each $ 12
3187.	do.	$3\frac{1}{4}$	" "	" 25
3188.	do.	$3\frac{3}{4}$	" "	" 30
3189.	do.	$4\frac{1}{4}$	" "	" 35

K. & E. CO. STEEL PENS.



No. 3201.



No. 3200.





No. 3202.

3200. Keuffel & Esser Co. Crow Quill Pens, 1 doz. in a box . . doz. $ 60

3201. Keuffel & Esser Co. Crow Quill Pens, 1 doz. pens No. 3200 and Holder, on a card . . . . . card 60



No. 3203.

3202. Keuffel & Esser Co. Drawing and Lettering Pens, 1 doz. in a box . . . . . doz. 60

3203. Keuffel & Esser Co. Drawing and Lettering Pens, 1 doz. pens No. 3202 and Holder, on a card . . . . . card 60

Pens No. 3200 and 3202 are specially made for Draftsmen for drawing and lettering on drawing paper, which has a more or less coarse surface. They have longer nibs and less sharp points than most others, possess great elasticity and permit of more rapid lettering or drawing, without scratching or catching in the grain of the paper. Draftsmen will prefer these pens to any other kind, as most others are intended principally for drawing on stone.



No. 3205.

3204. Keuffel & Esser Co. Lithographic Pens, 1 doz. in a box, doz. $ 60

3205. Keuffel & Esser Co. Lithographic Pens, 1 doz. pens No. 3204 and Holder, on a card . . . . . card 60

Pens No. 3204 differ from all other Lithographic Pens in having shorter (and therefore firmer) nibs, and points of the utmost fineness.



No. 3206.



No. 3206.

3206. Keuffel & Esser Co. Crow Quill Pens, No. 3200, with improved Holder with cork finger piece, each $ 10

do. do. do. ten pens, No. 3206 on a card 1 00

STEEL PENS.

JOSEPH GILLOTT'S.

3210.	Lithographic Crow Quill Pens, (No. 659),	doz. cards	$ 6 00	card	$	60
3211.	Superfine long shoulder Crow Quill Pens, (No. 850)	" "	7 50	"		75
3212.	Lithographic Pens, (No. 290)	" "	6 00	"		60
3213.	Mapping Pens, (No. 291)	" "	6 00	"		60

A "card" has 12 pens and 1 holder.

3214.	Mapping or Ladies Pens, (No. 170)	gross	1 00	doz.		10
3215.	Lettering Pens, (No. 303)	"	1 50	"		15
3216.	do. (No. 404)	"	1 00	"		10

FRENCH (B. P. Co.)

3217.	Crow Quill Pens, each with Holder,	doz. cards	$ 3 60	card	$	35

A "card" has 12 pens, each with holder.

K. & E. CO. PENHOLDERS.



No. 3220.

3220.	Improved Crow Quill Pen Holder	each	$ 05

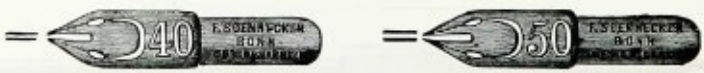


No. 3221

3221.	Improved Lettering Pen Holder	each	$ 05

These holders for crow quill and lettering pens are of the thickness of an ordinary penholder, a great improvement over the thin sticks generally used.

ROAD PENS.



No. 3222.

3222.	Road Pens, Nos. 40 and 50	per ¼ gross	$ 65	per dozen	$	35

These pens have two fine equal points and are used as road pens in map drawing.

For Round Writing Pens etc. see page 299.

PAYZANT (FREEHAND) BLOCK LETTERING PENS

with Ink Reservoir.



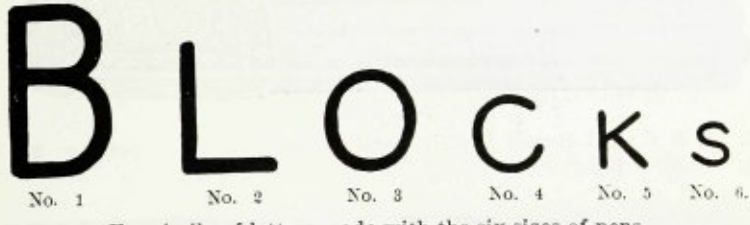
Patented



3224.	Payzant Block Lettering Pens, Brass, Nos. 1, 2, 3, 4, 5, 6,			each	$ 1 00
3225.	do. do. do.	do. Set of 6 pens, Nos. 1, 2, 3, 4, 5, 6, in partitioned paper box,		set	6 00
3224S.	do. do. do.	German Silver, Nos. 1, 2, 3, 4, 5, 6,		each	1 35
3225S.	do. do. do.	do. do. Set of 6 pens, Nos. 1, 2, 3, 4, 5, 6, in partitioned paper box,		set	8 10

The Payzant Block Lettering Pens are particularly adapted for lettering Engineers' and Architects' Drawings, for border lines or any heavy linework, also for the use of merchants for writing price and show cards, etc.

The common method of forming block letters with a fine pen is slow and tedious work and but few draftsmen are capable of executing neat lettering with reasonable rapidity. With the block lettering pen a letter is formed at a single stroke. There is no dexterity or knack to acquire to use these pens, as they are as simple to operate as a pencil. All irregularities due to the draftsman's failure to produce equal widths and parallel lines in forming letters, are avoided in work done with this pen, because all strokes in any direction are uniform in width and density. Work can be done in one-quarter of the time needed with the fine-pen method. It is unnecessary, even on the finest plans, to carefully outline the letters in pencil before inking, as a rough draft with guide lines is all that is needed. These pens are manufactured in six graded sizes; the following is a reproduction of letters made with them:



Fac-simile of letters made with the six sizes of pens.

Suggestions for using the Payzant Block Lettering Pen:

Fill the pen by quill or dropper, the same as a ruling pen is filled; never dip it into the ink.

After filling, adjust the nibs to the proper feeding distance, and test on scrap paper.

Should the pen become clogged while in use, open the nibs slightly and insert the edge of a piece of paper.

On drawings for which a fine finish is desired, add sharp corners to the letters with a fine pen and shade as required.

After using, remove the set-screw, open the reservoir and clean thoroughly.

LEAD PENCILS.

KEUFFEL & ESSER CO'S.



Our Paragon Pencils and Colored Pencils, are of the very best quality and possess all the merits of other best makes established in this market. They excel in **correctness and uniformity of grading**, and cost less than other similar pencils. We fully warrant these pencils and leads and solicit a trial of them.



3300. Paragon Pencils, extra fine quality, hexagon, yellow polish and gilt: HB, F, H, HH, HHH, HHHH (4), HHHHH (5), HHHHHH (6), ... per doz. $ 60



No. 3330.

3330. K & E Red Hexagon Pencils, finest quality . . . . per doz. $ 1 00
3331. do. Blue " " " " . . . . " " 1 00



No. 3335.

3335. K & E Red Round Pencils, finest quality . . . . . per doz. $ 75
3336. do. Blue " " " " . . . . . " " 75



No. 3340.

3340. K & E Red and Blue Hexagon Pencils, finest quality, per doz. $ 1 25
3345. K & E Round White Pencils (for blueprints etc.) . . " " 75

K. & E. CO. DETAIL PENCILS.



No. 3348.

3348. K. & E. Co. Detail Pencils, hexagon, gilt,
Nos. 2. 3. 4. 5 . . . . . gross $ 3 50 doz. $ 35

We recommend these Detail Pencils as being of excellent quality and carefully graded.

PENCIL HOLDER.



No. 3349.

3349. Holder for pencil stumps, hexagonal, metal ferrule . . . . each $ 05
3349D. do. do. do. do. do. do. do. double-end " 10

A. W. FABER'S PENCILS.



No. 3350.

3350. Hexagon, very best Castell, No. 2 B to 6 H . . . . . doz. $ 1 25
3351. do. " " Drawing, No. 1 — 5 . . . . . " 75
3352. Black round, best, No. 1 — 4 . . . . . " 50
3353. Yellow polished, round, No. 4 B to 4 H . . . . " 60

3360. Artist Pencil, Castell lead, double pointed, 2 B. to 6 H. . . each 35
3361. do. " " single point, " " " . . " 25
3362. do. best " " " " " " . . " 20

3370. Leads for Artist Pencils, Castell, 2 B. to 6 H. . . . . box of 6 65
3371. do. " " " best . . . . " " " 35

A. W. FABER'S WAX CRAYONS.

3375. A. W. Faber's Wax Crayons . . . . . doz. $ 1 00 each 10

No. 1.	White,	No. 62.	Orange,
" 2.	Yellow,	" 63.	Light green,
" 13.	Dark blue,	" 69.	Dark green,
" 30.	Sienna,	" 75.	Carmine,
" 38.	Vermilion,	" 88.	Light blue,
" 54.	Purple,	—	Finest black.

3376. A. W. Faber's Wax Crayons in boxes,

Box of	6	12	18	24	36	48	ass'td. colors
per box	$ 80	1 50	2 00	2 50	3 50	4 50	

KOH-I-NOOR PENCILS.



3380. Koh-i-noor Pencils, hexagon, yellow polish. BBBBBB (6), BBBBB (5). . . . . doz. $ 1 80
do. do. do. BBBB (4) . . " 1 50
do. do. do. BBB, BB, B, F, HB, H, HH, HHH, HHHH, (4). HHHHH (5), HHHHHH, (6), HHHHHHH, (7), HHHHHHHH, (8) HHHHHHHHH (9). . . . . " 1 25
3381. Koh-i-noor Copying Pencils . . . . . doz. 1 25



No. 3383.

3383. Koh-i-noor Artist Pencils, yellow polish. BBBBBB (6), BBBBB (5), BBBB (4), BBB, BB, B, F. HB, H, HH, HHH. HHHH (4), HHHHH (5), HHHHHH (6), HHHHHHH (7), HHHHHHHH (8), HHHHHHHHH (9) each $ 25



3385. Koh-i-noor leads for Artist Pencils, BBBBBB (6), BBBBB (5), BBBB (4), BBB, BB, B, F. HB, H, HH, HHH, HHHH (4), HHHHH (5), HHHHHH (6), HHHHHHH (7), HHHHHH HH (8), HHHHHHHHH (9) . . . . . per box of 6 $ 60

MEPHISTO COPYING PENCILS.

3390. Mephisto Copying Pencils (No. 73 B) . . . . . doz. $ 75
3391 do. do. do. (No. 73 B extra hard) . . . . . " 90
3392. do. do. do. with red tip (No. 77) . . . . . " 90

RED CHALK.



No. 3401.



3404.

3400. Red Chalk (Keel) in Cedar, for marking stakes (7 × $\frac{3}{8}$ in.) doz. $ 60
3401. do. " " " " " " (4$\frac{3}{4}$ × $\frac{3}{4}$ ") " 1 00
3402. Red Chalk (Keel) in Sticks, covered with paper, (3$\frac{1}{2}$ × $\frac{3}{8}$ ") " 20
3403. do. " " " " " " (4 × $\frac{9}{16}$ ") " 40
3404. do. " " " " " " (4 × $\frac{3}{4}$ ") " 60
3405. Keel, in lumps . . . . . per pound 15

SPONGE RUBBER

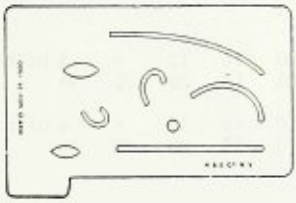
for Cleaning Drawings.



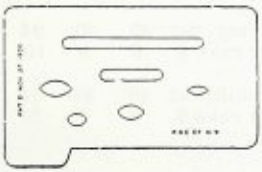
No. 3408.

3406.	Sponge Rubber, with solid back,	1	×	1	×	1	in.	each	$	12
3407.	do.	"	"	"		2½ × 1¾ × ⅝	"	"		30
3408.	do.	"	"	"		4 × 2 × 1	"	"		60
3409.	do.	"	"	"		6 × 4 × 1	"	"	1	80

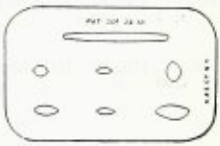
ERASING SHIELDS.



No. 3411.



3411 S.



3411 M.

3411	Xylonite Erasing Shield	for Draftsmen, about	3⅜ × 5 in.	each	$ 20
3411 S.	do.	do.	" 2⅞ × 4½	"	" 15
3411M.	Metal	do. nickelplated	" 2⅜ × 3¾	"	" 20

ALBA RUBBER.



No. 3415.



3416.

The ALBA is a high-grade eraser, smooth finish and of exceptional purity. It takes hold readily, will not smudge nor stain the paper and retains its excellent qualities for a long time.

3415.	Alba Pencil Rubber, flat,	40	30	20	16	12	8	4 to lb.
	per cake $	6	8	12	15	20	25	50
3416.	Alba Pencil Rubber, oblong,	40	30	20	16	12	8 to lb.	
	per cake $	6	8	12	15	20	25	



No. 3417.



3418.

3417.	Alba Ink Eraser,	flat,	1½ × 1 × 3/16 in.	per cake	$ 05
3418.	do.	oblong,	2⅜ × ½ × 5/16 "	"	" 06
3419.	do.	"	3¼ × ⅝ × ⅜ "	"	" 10

A. W. FABER'S RUBBERS.

3425. Artist Rubber, flat,	40	30	24	20	16	12	8	4 to lb.
per cake $	06	08	10	12	15	20	25	50

3440.	Ink Eraser, flat	per cake $	05
3441.	do. " large	" "	10
3442.	do. " extra large	" "	20
3445.	Ink and Pencil Eraser in Wood	" "	15
3446.	do. do. Mammoth	" "	25

HARDTMUTH'S PLIABLE RUBBER.



3450. Pliable Rubber, grey, flat,	40	30	24	20	16	12	8	4 to lb.
per cake $	6	8	10	12	15	20	25	50
3451. Pliable Rubber, pink, flat,	40	30	24	20	16	12	8	4 to lb.
per cake $	6	8	10	12	15	20	25	50

EMERALD RUBBER.



No. 3455G.

3455G. Emerald Rubber, oblong, wedge edge,	48	36	24	20	12 to lb.
per cake $	05	07	10	12	20

RUBY RUBBER.



No. 3455R.

3455R. Ruby Rubber, oblong, wedge edge,	48	36	24	20	12 to lb.
per cake $	05	07	10	12	20

STEEL ERASERS.



No. 3480 and 3480½.

3480.	Steel Eraser with long blade,	Bone	Handle,				Domestic . .	each $	50
3480½.	do.	"	"	"	"	"	Rodger's . .	"	1 25
3481.	do.	"	"	"	Coco	"	Domestic . .	"	45
3481½.	do.	"	"	"	"	"	Rodger's . .	"	80



No. 3486 and 3486½.

3485.	Steel Eraser with short blade,	Bone	Handle,				Domestic . .	each $	50
3485½.	do.	"	"	"	"	"	Rodger's . .	"	75
3486.	do.	"	"	"	Coco	"	Domestic . .	"	35
3486½.	do.	"	"	"	"	"	Rodger's . .	"	60

LEAD PENCIL FILE.



No. 3488.

3488. Lead Pencil File and Tack Lifter, 6 in. . . . . each $ 25

A convenient little tool, consisting of a steel file with a steel tack lifter at the end, black wooden handle.

PENCIL POINTERS.

These Pencil Pointers consist of sheets of flint paper made into a block.



No. 3500.

3500.	Pencil Pointer,	2	×	2½	in.	. . . . .		each $	10
3501.	do.	2½	×	4	"	. . . . .		"	15
3502.	do.	1¼	×	4	"	. . . . .		"	10

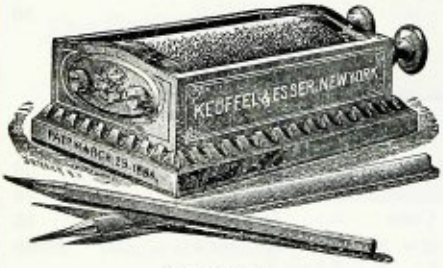


No. 3507 and 3508.

3505.	Pencil Pointer with wooden handle,	2	×	2½	in.	. . . . .		each $	15
3506.	do.	"	"	"	2½	×	4 "	"	20
3507.	do.	"	"	"	1¼	×	4 "	"	15
3508.	do.	like No. 3507 but of emery paper, 1¼ × 4 in. .						"	20

PENCIL POINTERS & PAPER WEIGHTS.

Patented



No. 3510.



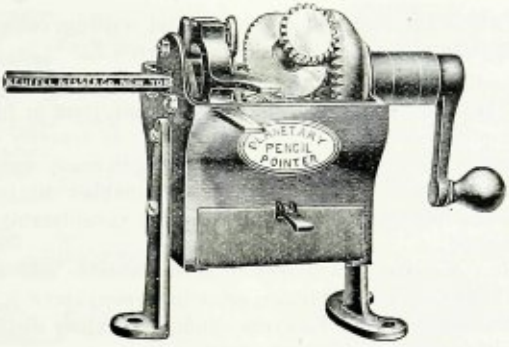
3511 and 3513.

All Pencil Pointers brought before the public so far, had the great disadvantages of soiling the hand and all articles with which they came in contact and of requiring the use of both hands in pointing a pencil. Our Pencil Pointers and Paper Weights entirely obviate these drawbacks. The filings of the pencil-lead fall into the box which forms the body of the apparatus. Its weight holds it steady, so that a pencil can be sharpened with one hand while the other holds the scale, triangle, protractor or other drawing implement. In the "Convenient" Pencil Pointer the sandpaper is mounted on rollers, so that all parts of it can be used successively, and it is easily replaced when worn.

The "Useful" Pencil Pointer is a modification of the "Convenient." The roller has 6 faces, so that it will last a long time. Besides there are with each Pencil Pointer, 2 extra sandpaper coverings for the roller. The box catches the debris from the pencil and is heavy enough to require no holding during use, and to make a good paper weight.

3510.	"Convenient" Pencil Pointer and Paper Weight, about 2¾ lbs.	each	$ 80
3511.	"Useful" Pencil Pointer and Paper Weight, about 1½ lbs.	"	40
3512.	"Useful" Pencil Pointer and Paper Weight, like No. 3511, but with two rollers, the second covered with velvet, for wiping pencil after sharpening	"	60
3513.	"Useful" Pencil Pointer and Paper Weight, like No. 3511, but of bright bronze, finely finished	"	1 00

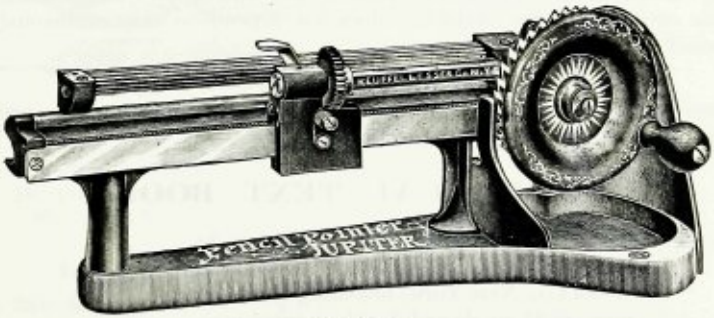
PENCIL SHARPENERS.



No. 3515.

3515.	Planetary Pencil Sharpener	each	$ 4 50
3516.	Extra Knives for Planetary Pencil Sharpener	pair	65

The Planetary Pencil Sharpener makes a perfect point on all kinds, grades and sizes of lead or slate pencils, wax crayons etc. It can be attached to the wall or table.



No. 3518.

3518.	Jupiter Pencil Sharpener	each	$ 8 50
3518W.	New Cutting wheel	"	1 50
	Allowance for return of old cutting wheel, 25 cents.		

The Jupiter Pencil Sharpener excels all others in workmanship and the ease with which it can be operated. The cutting wheel is made reversible, so that, when one side is dull, the other can be used. This wheel can not be re-cut when it has become dull, but must be replaced.

Round Writing

F. SOENNECKEN'S system of ornamental writing, called Round Writing, needs hardly any recommendation on our part.

The Methodical Text-Book for self-instruction is a complete guide for acquiring this beautiful hand in a very short time (ten to fourteen lessons suffice for a complete course in schools), and there is scarcely any profession but could advantageously make use of this writing in many ways.

Engineers, Architects and Draftsmen are enabled to letter drawings, maps, etc. in Round Writing more elegantly and in considerably less time than by any other method.

Bankers and Merchants will find it most valuable and appropriate in heading books, filling out check blanks, price lists, etc., etc.

Insurance Companies and Lawyers cannot use more distinct letters for filling out or writing policies and legal documents.

Storekeepers can write neat show cards or price-tags in this hand.

IN ORDER TO LEARN ROUND WRITING

it is **indispensable** to thoroughly study and strictly observe the directions given in the

METHODICAL TEXT BOOK

especially with respect to the holding of the pen and to the exercises in writing.

The book plainly shows the scientific principles on which this Writing System is based; all efforts to master it by using the pens without the Text Book will be unsuccessful, vainly wasting time and labor. The correct and artistic execution of the characters does not depend, as may erroneously be supposed, on the

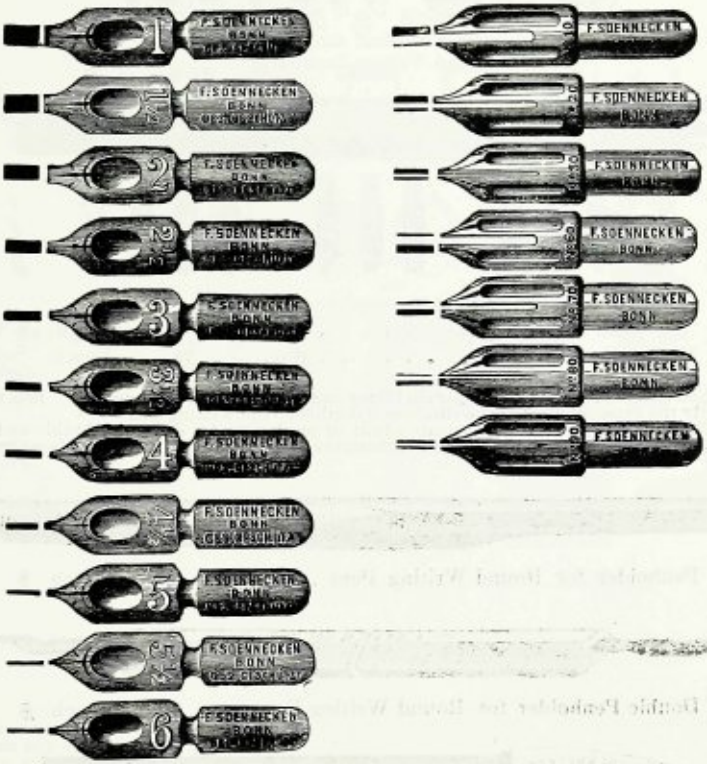
ADROITNESS OF THE HAND,

but merely on the thorough knowledge of the manner of holding the pen and of the system of the characters as exhibited in the

METHODICAL TEXT BOOK.

3520.	Methodical Text-Book to Round Writing by F. SOENNECKEN, (published by KEUFFEL & ESSER Co., New York) including an assortment of 25 single and double-pointed pens.	each	$	1	00	post paid	$	1	10
3521.	do. do. do. Book without pens .	"			65	" "			70
3522.	do. do. do. do. bound in cloth, with an assortment of 25 pens . . .	"		1	60	" "		1	78
3523.	Copy Book without Instructions (School Ed.) including an assortment of 25 single and double-pointed pens . .	"			70	" "			80
3524.	do. do. do. Book without pens .	"			35	" "			39

ROUND WRITING PENS
SOENNECKEN'S, GENUINE.



3530. Single Pointed Pens, No. 1, 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, any one number, per gross $ 85 post paid $ 1 00
3531. do. do. do. do. " ¼ " 25 " " 31
3532. Double-Pointed Pens, No. 10, 20, 30, 60, 70, 80, 90, any one number . . . " ¼ " 65 " " 71
" doz. 35 " " 41

Each gross or ¼ gross box contains Pens of one number only.

3533. Sample Assortment of Single and Double-Pointed Pens, with Inkholder, 25 in a box $ 35 post paid 41



No. 3532½.



No. 3535.

3532½. Three-Pointed Pen, for ornamental work, doz. $ 50 " " 56
3535. Inkholder for single-pointed Pens, specially for writing with India or Autograph Ink, per box of 6 $ 30 each 10

Musica

The above specimen is a reduction to one-half size of the original, as executed with the Round Writing Instrument.



3536. Round Writing Instrument, complete with 9 minute pens . . . . . each $ 1 00 postpaid $ 1 10

3537. Minute Pens for above . . . . . doz. 75 each 10

With this instrument 2 or 3 parallel lines can be made with one motion. It is used in exactly the same manner as the single and double round writing pens.

The accompanying 9 minute pens admit of producing 144 different double and 504 different triple lines, by changing or interchanging the pens in the different places in the holder.



3560. Penholder for Round Writing Pens . . . . . each $ 10



3561. Double Penholder for Round Writing Pens . . . . . each $ 10



3564. Parcel Pens, in 4 widths, for bold and large lettering,

No.	F	M	B	BB	
	$\frac{7}{100}$	$\frac{7}{60}$	$\frac{13}{60}$	$\frac{18}{60}$	in. wide . . each $ 25

MAHOGANY BOXES WITH ROUND WRITING PENS.

3565. Box with 11 penholders, each with 2 pens . . . . . box $ 2 00

RULED SHEETS.

3568. Ruled Sheets for the different sizes of letters of Round Writing, both sides, one pattern on each page, imprint $6\frac{1}{2} \times 8$ in., 5 patterns . . . . . per sheet $ 06

These sheets are placed under blank paper to serve as rulings for writing.

DRAUGHTSMAN'S ALPHABET

BY

KEUFFEL & ESSER CO.



3570. Draughtman's Alphabet, cloth bound, board cover with gilt imprint, size 7 × 10½ in. . . . . each $ 1 50
post paid . . . " 1 60

The above cut shows reduced specimens of our "**Draughtsman's Alphabet**", which gives on 31 pages a larger variety of Alphabets, Numbers, Topographical Signs, etc. than any other book of the same size, and will be found the most useful to draftsmen. The selection of the contents of the book is made with great care, and it is engraved with reference to practical use, so that each letter, number or sign may be copied without difficulty, which is almost an impossibility with the fine copper and steel engraved books, made only for the purpose of showing fine and elaborate engraving.

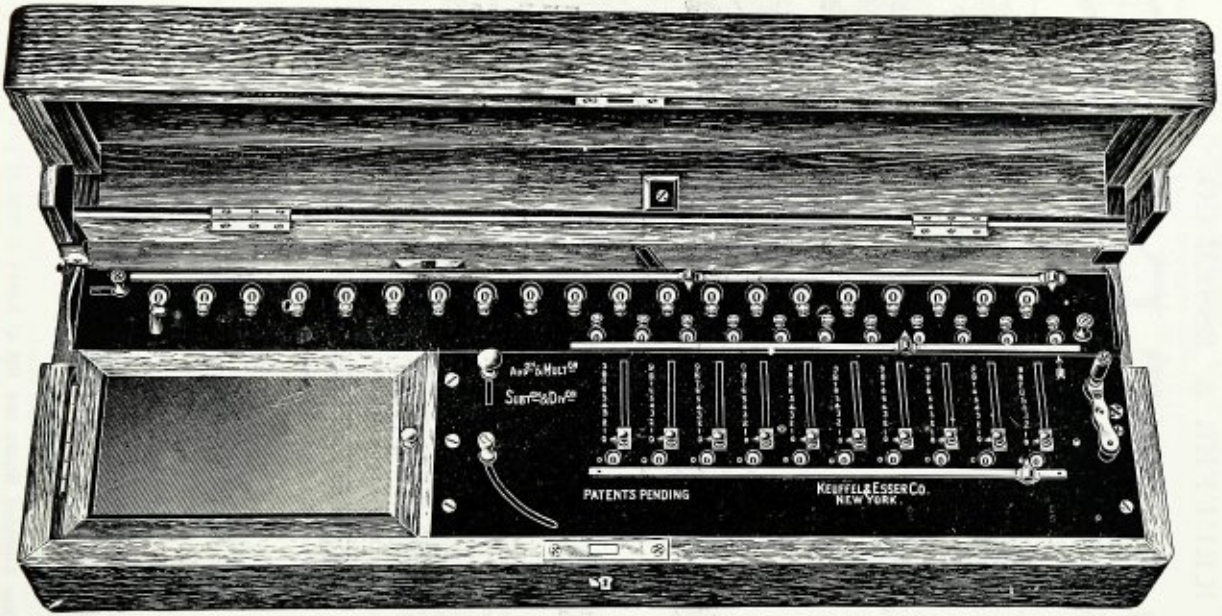
We trust that this work will continue to meet with general approval as many draftsmen have contributed to it by suggestions for making it perfect and indispensable to anyone requiring a book on lettering.

Students' Alphabets

3571. Student's Alphabets, a selection of the most useful alphabets from above book, paper cover . . . . . each, $ 25
post paid . . . " 27

For other Alphabet Books see list of books at end of catalogue.

No. 4007 N.



IMPROVED RECKONING MACHINE.

4005N. 6 figures for Multipli and or Divisor, 7 figures for Multiplier or Quotient, 12 figures for Product or Dividend . . . . . each $250.00

4006N. 8 figures for Multiplicand or Divisor, 9 figures for Multiplier or Quotient, 16 figures for Product or Dividend . . . . . " 300.00

4007N. 10 figures for Multiplicand or Divisor, 11 figures for Multiplier or Quotient, 20 figures for Product or Dividend . . . . . " 375.00

THE IMPROVED

RECKONING MACHINE.

A PERFECT MECHANICAL CALCULATOR.

Our Improved Reckoning Machines are perfect instruments, both mechanically, and in their functions.

Any arithmetical problem

from multiplication, division, simple addition and subtraction to the most intricate calculations can be solved, without mental effort, with unfailing accuracy and surprising rapidity.

The tiresome mental labor of calculating in the ordinary way, is reduced by the Reckoning Machine to a simple jotting down of the results obtained.

Squaring, Cubing, Extracting square roots, Percentage, Conversion of monies, weights and measures, Prorating, any kind of Commercial, Statistical or Scientific calculation can be done by the Reckoning Machine without effort with the greatest precision and extreme rapidity.

The Machine is built in the most substantial manner so that it will retain its efficiency an l accuracy for a very long time. There are a great many of our Machines in use in public and private offices and scientific laboratories and they are giving the greatest satisfaction.

The valuable patented improvements which we have recently added to our Reckoning Machines are:

The **new cancelling device** which, at one shift of the handle sets all the keys in the grooves of the key-plate back to zero, thus saving the time lost in moving each key to the zero position separately.

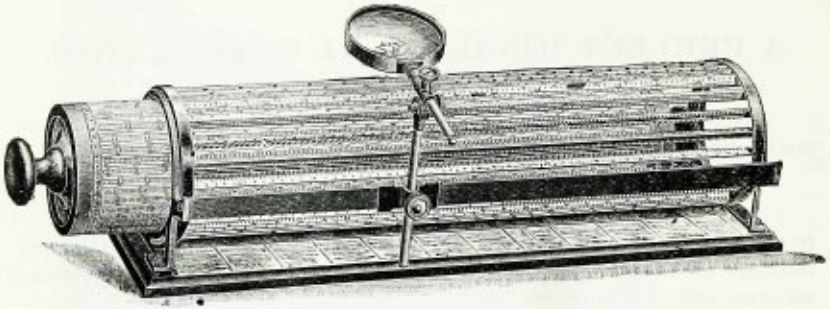
A **line of windows below the grooves** of the key-plate, in which the settings of the several keys are indicated by figures, so that on our Machines the two factors of a calculation and their product, each appear in one straight line of figures This feature is a safeguard against error in reading the settings of the keys, which otherwise often present a very irregular line.

Decimal pointers, which are arranged to slide on bars so that they may be set quickly and permanently wherever a decimal point is to be indicated. This device will be found much handier and safer than the old method of using pegs, which are inconvenient to handle, liable to drop out and easily lost.

A book containing a full description, all the necessary rules for operating and numerous examples, both general and special, accompanies each one of our Reckoning Machines.

SLIDE RULES.

THACHER'S CALCULATING INSTRUMENT.



No. 4013.

4012. Thacher's Calculating Instrument, cylinder 18 in., in polished Mahogany Box, with full Directions . . . . . each $ 35 00

4013. do. do. do. with 3-in. reading glass sliding on brass bar, adjustable to any part of the instrument and for focus . . . . . " 45 00

Thacher's Calculating Instrument is a device for performing a great variety of useful arithmetical calculations with rapidity and accuracy. Its operation is simple and readily learned. By its use the tedious drudgery of calculation is avoided and the chance of error eliminated.

As is shown in the illustration the instrument consists of a cylinder 4 in. in diam. and 18 in. long, which revolves in an open framework composed of 20 angular bars held between two metal rings. The cylinder bears a scale corresponding to the scale of the Slide Rule, which is duplicated on the exposed sides of the bars. Results can be obtained to the fourth and usually to the fifth place of figures with a surprising degree of accuracy, sufficient for nearly every requirement of the professional or business man. Examples in multiplication, division, proportion powers or roots involving not more than three quantities, are solved by one operation, and any number of values of an algebraic function composed of two constants and a single variable may generally be found by one setting.

The useful applications of the instrument are almost unlimited; among them may be mentioned finding the stresses and sections in trusses and girders, mensuration, estimates of work and material, solving trigonometrical formulas, making and applying tables, problems in mechanical powers, machinery and hydraulics, problems in simple and compound interest, discount, pro-rating, the conversion of weights and measures, cost of merchandise with per cent. of duty or profit added.

For example, any of the formulas

$$\frac{ax}{b}, \quad \frac{ax^2}{b}, \quad \frac{ax}{b^2}, \quad \frac{ax^2}{b^2}, \quad \sqrt{\frac{ax}{b}}, \quad \sqrt{\frac{a^2x}{b}}$$

in which a and b may have any values and x any number of values are readily solved by one setting. Squares, square roots, cube roots and reciprocals are also readily worked.

The following are a few problems which may be readily solved by the use of Thacher's Calculating Instrument:

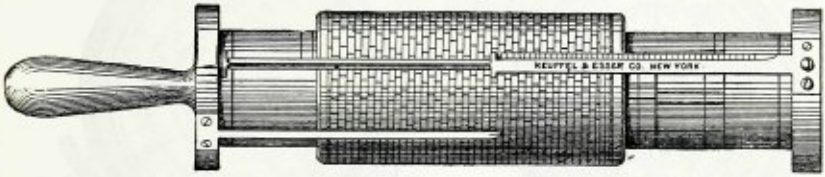
A 15-in. "I" beam, resting upon supports 14.5 ft. apart sustains a load of 17500 lbs. at the centre. What weight of beam is required if S = 10000 lbs. per sq. in. (This problem is solved in three settings of the instrument.)

$541.35 are to be divided pro-rata among various accounts amounting to $7435.00 required the amount going to account of $427.50, $763.80, etc. (The several amounts are each found in one setting.)

A train weighing 2500 lbs. per lineal foot passes over a bridge on a 4° curve at a speed of 30 miles an hour; required its effect upon the lateral system. (This problem is solved in one setting.)

What will be the amount of $250.00 placed at compound interest for 10 years at 6%. (This problem is solved in one setting.)

FULLER'S SLIDE RULE.



No. 4015

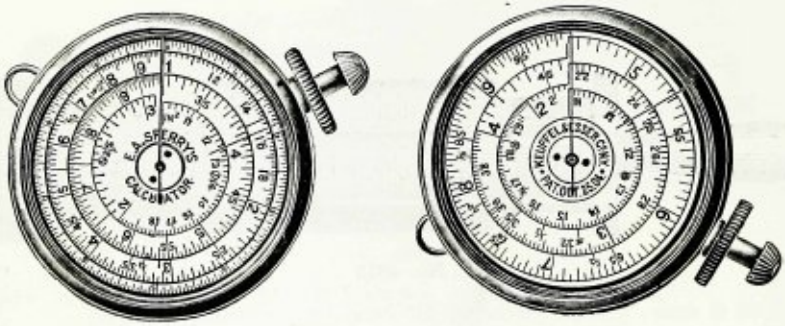
4015. Fuller's Spiral Slide Rule, in Mahogany Box, with Directions . . . . . each $ 30 00

Fuller's Spiral Slide Rule consists of a hollow cylinder which can be moved up or down or around an inner cylinder provided with a handle. A single logarithmic scale nearly 42 feet long, is wound spirally around the outer cylinder. There are two indexes: a fixed one attached to the handle, and a movable one attached to a brass tube sliding in the inner cylinder. This latter bears two indexes (whose distance apart is the axial length of the complete spiral) and a scale of equal parts for the rapid finding of logarithms. On the inner cylinder is a number of valuable tables and settings.

Ratios are established by setting a given number to the fixed index, setting the movable index to another given number, bringing any other number to the fixed index and reading the fourth term at the movable index. Hence the Fuller Rule requires setting each time the third term of a proportion changes and it does not give a complete series of equal ratios at sight, like the Thacher and Mannheim Rules. In prolonged use the weight of the rule is a disadvantage, as it must be held by hand.

SPERRY'S POCKET CALCULATOR.

(Patented.)



S dial No. 4017. L dial

4017. Sperry's Pocket Calculator, watch pattern, diam. 2⅛ in., with two engraved metal dials, with Directions. . .each $ 15 00

Sperry's Pocket Calculator represents a new departure in pocket calculators as by its construction the length of the logarithmic scale is increased from about 6½ in. (in other calculators) to an actual length of about 12½ inches, which however owing to the arrangement of the scales, allows of reading results nearly as close as on the C D scales of a 20-in. straight slide rule. The instrument has the form of a watch, with an engraved glass covered metal dial on each side. Each dial has an index hand and a stationary pointer, which together take the place of the indicator (runner) of a straight slide rule. There is a small ring on the case for attaching the instrument to the watch chain. The two dials are revolved together by a milled thumbnut which is concentric with the knob which revolves the two indexes (hands) together.

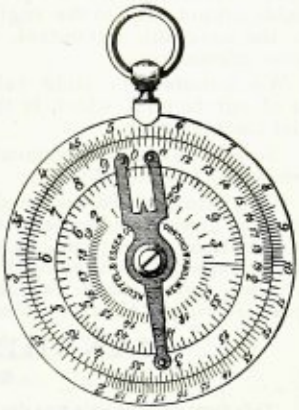
The S dial bears a scale of equal parts, a circular logarithmic scale and a scale of square roots. It corresponds to the two outer scales and the scale of equal parts of the straight slide rule. The L dial bears a logarithmic scale arranged in three spiral rings beginning and ending on the same radial line.

Sperry's Pocket Calculator can neither warp nor shrink as it is entirely of metal. The scales are circular and are therefore practically endless, so that they can be used "around and around," each "re-set" multiplying or dividing the value of the reading, without loss of time or interruption. The result never lies beyond the end of the scales as it sometimes does in the straight slide rule.

K & E AND CHARPENTIER CIRCULAR CALCULATORS.



No. 4018.



4020.

4018. K & E Calculator, watch pattern, diam. 2¼ in., 2 glass—covered engraved metal dials, with Directions . . each $ 13 50

The K & E Calculator is practically a circular Mannheim Rule. It has two dials, one of them revolving, the other stationary.

The revolving dial has a scale of logarithmic numbers corresponding to the C. D. scales of the straight Mannheim rule, and a scale of squares corresponding to the A. B. scales of the straight rule. There is an indicator line engraved on the glass.

The stationary dial has a scale of tangents, scale of equal parts and a scale of sines, the latter on a two-turn spiral line.

The index hands of the two dials move simultaneously. The movable dial and the index hands are revolved respectively by a concentric thumb nut and knob. There is a small ring on the case for attaching the instrument to the watch chain.

This form of Mannheim rule has the advantage over the straight rule that the scales are practically endless, so that they can be used "around and around," each "re-set" multiplying or dividing the value of the readings without loss of time or interruption. The result never lies beyond the end of the scale, as it sometimes does in the straight slide rule.

4020. Charpentier Calculator . . . . . each $ 5 00

The Charpentier Calculator is a circular slide rule 2⅝ in. diameter, with a circular slide which is revolved and set by the handle. This instrument being made of metal is but slightly affected by atmospheric variations. On the face of the calculator (shown in cut) there is a logarithmic scale on the slide corresponding to another such, external to it on the body of the rule. On the surface within the slide are the square roots in two circles, one from 0 to 3.162, the other from 3.162 to 10. They are made to coincide with the outermost scale by means of an index. On the other side of the rule there are three scales, an outer one of equal parts and two inner ones of angles from 0 to 90 and from 0 to 45 respectively; the latter two give the sines of the first and the tangents of the second on the scale of equal parts, by means of an index. The indexes on the two faces correspond, so that the logarithms of the numbers on the logarithmic scale can be read on the scale of equal parts.

K & E SLIDE RULES.

The Slide Rule in its present perfected form has become an indispensable aid not only to the engineer and scientist, but also to the manufacturer, the merchant, accountant, and all others whose occupation or business involves calculations.

We manufacture slide rules and devote to them a separate department of our factory, which is thoroughly equipped with the most improved special machinery.

Several of our improvements are protected by patents, and are therefore not embodied in other Rules.

Great care has been bestowed on the numbering of our Rules to make them as clear and distinct and as permanent as possible. We prefer not to number the subdivisions throughout, as is done on some of the printed rules. The **sub-numbers** are not required by the adept, they even are confusing and interfere with rapid and accurate reading. Should they be desired for any special purpose, *we will put them on without extra charge.*

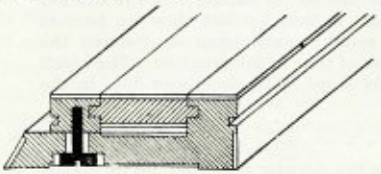
MANNHEIM SLIDE RULES

No. 4031, &c.

This form of slide rule was devised by Lieut. Mannheim. The lower scales (on the rule and on the slide) are single while the two upper scales are double. There is an indicator (runner) for finding coinciding points on the scales, which admits of working out extensive calculations without taking intermediate readings, thus increasing the accuracy of the final reading. It is used also in involution and evolution.

On the under face of the slide are scales of sines, tangents and equal parts. The index mark on the under side of the body of the rule permits of reading the scales on the under face of the slide without reversing it. The under surface of the rule has a table giving a number of settings and ratios.

It is well known that the materials of which most slide rules are made are affected by atmospheric changes, notwithstanding previous treatment or seasoning. Even in the best rules, except those of metal the slide is liable to work too tight or too loose from changes in the materials. Various means have been devised to overcome this defect but each of them had some serious drawback. In those in which the base or stock is cut lengthwise into halves which are approximated by springs, there is danger of their shrinking unevenly, and they do not afford a rigid bed for the slide. In those which have springs to hold one edge of the slide against the rule, there is a corresponding gap at the other edge of the slide.



Cross section of K & E Patent Adjustable Slide Rule.

The **K & E Patent Adjustable Mannheim Slide Rule** has sucessfully overcome these various drawbacks and solves the problem perfectly. One of the grooved guide pieces in which the slide moves is held in place by setscrews which hold it rigidly but still permit of quick and exact adjustment when they are released, as they pass through oblong slots giving ample play. If adjusting should become necessary, it is effected by loosening the screws and bringing the movable guide piece against the slide, according to the friction desired, when the screws are again tightened.

The **Duplex Slide Rule.** whose special features are described on page 311, is also provided with a new device (patent pending) for regulating the friction of the slide. The German silver bars which join the two sides of the rule, are provided at the ends with setscrews moving in oblong slots. On releasing these screws, one bar of the rule can be shifted towards or away from the slide, to obtain the desired friction, when it is clamped in place by tightening the setscrew.

MANNHEIM SLIDE RULES.

K & E ADJUSTABLE

Patented.

5-INCH RULE.

4031. K & E Patent Adjustable (Mannheim) Slide rule, 5-in., engine divided, divisions on white facings, glass Indicator, in sewed Leather Sheath, with Directions each $4 50

This rule is subdivided as closely as the 10-in. rule, No. 4041.

8-INCH RULE.

4035. K & E Patent Adjustable (Mannheim) Slide Rule, 8-in., engine divided, divisions on white facings with glass Indicator, in sewed Leather Sheath, with Directions . " 4 50

This rule is subdivided as closely as the 10-inch. rule, No. 4041.

10-INCH RULES.

4041. K & E Patent Adjustable (Mannheim) Slide Rule, 10 in., engine divided, divisions on white facings, glass Indicator, in Case, with Directions . . . . . " 4 50

4041 F. Do., like 4041, but subdivided as closely as the 20-in. rule . . . . . " 8 00

4041 S. Sewed Leather Sheath for rules 4041, 4041 F. " 80

do., do., in place of regular case . . . extra " 40

16-INCH RULE.

4045. K & E Patent Adjustable (Mannheim) Slide Rule, 16-in., engine divided, divisions on white facings, glass Indicator, in Case, with Directions . . . . . " 10 00

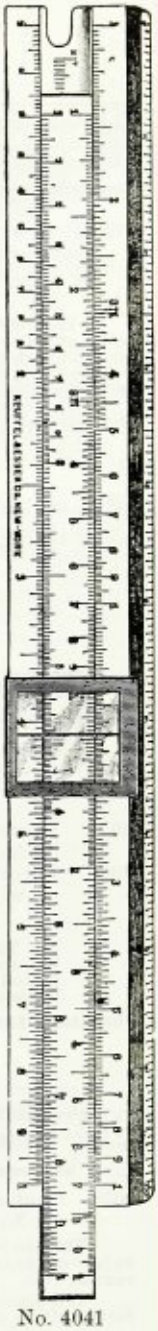
20-INCH RULE.

4051. K & E Patent Adjustable Mannheim Slide Rule, 20-in., engine divided, divisions on white facings, glass Indicator, in Case, with Directions . . . . . " 12 50

Rules 4041 F., 4045 and 4051 are divided more closely than the others. They have from 200 to 20 subdivisions between numbers, while the other rules have from 100 to 10, so that reading is closer by at least one figure and another one can be safely estimated.

4052 D. L. Glass Indicator with two Hairlines (instead of one) . . . . . extra " 20

FOR MAGNIFIERS
INDICATOR WITH DECIMAL POINTER
BOOKS ON THE SLIDE RULE
SEE PAGE 313



No. 4041

POLYPHASE SLIDE RULE,

PATENT PENDING.

MANNHEIM STYLE. K & E ADJUSTABLE.



4053. Polyphase Slide Rule, K & E Patent Adjustable, 10 in., engine divided, divisions on white facings, glass Indicator, in Case, with Directions . . . . . each $ 5 00

FOR LEATHER SHEATH SEE No. 4041 S., PAGE 309.

The Polyphase Slide Rule has in addition to the regular scales of the Mannheim, a scale of cubes on the Vertical edge of the rule and an **inverted** scale (C I.), on the face of the slide which scales may readily be used in conjuction with the other scales by means of the indicator. This arrangement combines some of the features of the Duplex Rule with the regular Mannheim type.

The inverted scale enables taking three factors at one setting of the slide, and reading reciprocals by means of the indicator. Such expressions as

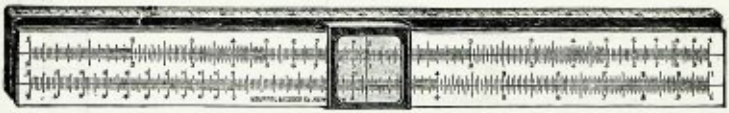
$\sqrt{a^3}$; $\sqrt[3]{a^2}$; $\sqrt[3]{\frac{1}{a^2}}$ may be read by means of the indicator.

a^5 ; a^6 ; a^9 ; $\sqrt{a^5}$; $\sqrt[3]{a^5}$; $\sqrt[4]{a^5}$; $\sqrt[3]{a^4}$; $\sqrt[3]{\frac{a}{b^2}}$

$a^2 \times \sqrt[3]{b^2}$; $\sqrt{\frac{a^3 \times b^3}{c^3}}$ and almost any combination of three factors involving square, square root, cube and cube root, may be solved at one setting of the slide.

FAVORITE SLIDE RULES.

MANNHEIM STYLE.



No. 4054.

4054. Favorite (Mannheim) Slide Rule, 10 in., divided on white facing, with glass Indicator, in Case, with Directions . each $ 3 00

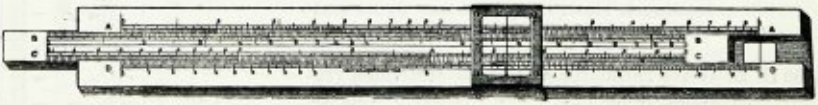
4056. Favorite (Mannheim) Slide Rule, 10 in., polished boxwood, with metal Indicator, in Case, with Directions . . . . " 2 75

FOR SUB-NUMBERING SEE PAGE 308.

The Favorite Slide Rules are of the same pattern as Nos. 4041, but they are not adjustable. They are an improvement over the imported rules, being made of materials seasoned here and therefore less liable to warp or shrink.

FOR MAGNIFIERS, INDICATOR WITH DECIMAL POINTER, BOOKS ON THE SLIDE RULE, SEE P. 313.

STUDENT'S SLIDE RULE.



4058. Student's Slide Rule, (Mannheim), 10 in., transparent Xylonite Indicator in metal frame, with Directions . . each $ 1 00

The Student's Slide Rule is intended only for the use of students, to enable them to become familiar with the slide rule without incurring the expense of obtaining the regular rule.

It is similar to our Mannheim Slide Rule, and the graduations are on white paper facing with a protective coating. With each rule we furnish plain Directions.

DUPLEX SLIDE RULES

Patented.

K. & E. Adjustable, (Patent Pending.)



No. 4071 (front)



No. 4076 (back)

In the "**DUPLEX**" **SLIDE RULE** the slide is of the same thickness as the rule and has its two faces flush with those of the rule. The rule and slide are fully graduated on both sides, scales A and D being alike on both sides of the rule, whereas scales B and C on the **arithmetical slide** are graduated on their upper face in the usual way like A and D, but on their under face in **reversed order**, the initial indexes being on the right hand, and the scales progressing towards the left. The indexes of the scales of one face are in alignment with those of the other face, and an indicator (runner), encircling the whole rule, enables coinciding points on any scales of either face to be at once found.

This improvement simplifies considerably the working out of many complex calculations, for example such operations as

$$a \times b \times c = x; \quad \left(a^c = x\right); \quad \frac{a}{b \times c \times d} = x; \quad \sqrt{a^5} = x$$

may be readily performed. Besides, there is on the Duplex Rule an inverted slide always in position, with the numbers right-side up and the corresponding scales contiguous, instead of the numbers inverted, and scale C next to A, and B next to D.

To still further increase the value of the Duplex Rule we furnish it also with **trigonometrical scales**, Sines, Tangents and Scale of equal parts in addition to the arithmetical scales enumerated in the above description. In this form the Scale of Sines and of Tangents are each on one side (face) of the slide, on the median line, and the scale of equal parts is on the vertical edge of the rule on a white facing. The S and T scales and the scale of equal parts are read by means of the indicator. The rules having these additional scales are designated as with "**trig. scales**" in this list.

The Duplex Slide Rules are engine divided, the divisions on white facings.

5-INCH RULES.

4061. Duplex Slide Rule, 5 in., glass Indicator, in sewed leather Case, with Directions . . . . . each $ 5 00

4061. T Duplex Slide Rule, 5 in., with **trig. scales**, glass Indicator, in sewed Leather case with Directions . . . . . " 6 50

8-INCH RULES.

4065. Duplex Slide Rule, 8 in., glass Indicator, in sewed leather Case, with Directions . . . . . each 5 00

4065. T Duplex Slide Rule, 8 in., with **trig. scales**, glass Indicator, in sewed leather Case, with Directions . . . . . " 6 50

10-INCH RULES

4071. Duplex Slide Rule, 10 in., glass Indicator, in Case, with Directions . . . . . each $ 5 00

4071. T Duplex Slide Rule, 10 in., with **trig. scales**, glass Indicator, in Case, with Directions . . . . . " 6 50

16-INCH RULES

4083. Duplex Slide Rule, 16 in., glass Indicator, in Case, with Directions . . . . . " 12 00

4083. T Duplex Slide Rule, 16 in., with **trig. scales**, glass Indicator, in Case, with Directions . . . . . " 15 00

20-INCH RULES

4087. Duplex Slide Rule, 20 in., glass Indicator, in Case, with Directions . . . . . " 15 00

4087. T Duplex Slide Rule, 20 in., with **trig. scales**, glass Indicator, in Case, with Directions . . . . . " 18 00

VERNIER

4087 V. Vernier to index line on indicator, for reading the scale of equal parts (logarithms) on edge of rule, (only for rules with trig. scales) reads to four places. . . . . extra, " 1 00

LOG. LOG. DUPLEX SLIDE RULE.

Patented.

K & E Adjustable, Patent Pending.



No. 4092.

4092. Log. Log. Duplex Rule, 10 in., with Directions . . . . . each $ 8 00

The Log. Log. Duplex Slide Rule has, in addition to the scales of the regular Duplex slide rule, a Log. Log. scale, 3 fold, graduated from 1.01 to 22000. with which any root or power of any quantity up to 22000. may be determined by direct operation at one setting of the slide.

Exponentials generally and the many formulas in electrical and mechanical engineering involving fractional powers or roots, hyperbolic logarithms, etc., are readily handled with the help of this scale.

The hyperbolic or natural logarithm of a quantity with its characteristic may be read by means of the indicator without setting the slide, or may be used directly as a factor when required in any formula.

The scales are arranged as follows:

On the front face are the regular A. B. C. D. scales, and a scale of sines in the usual order.

On the reverse face there are, in the order named,
Log. Log. scale, 3 fold,
The C. scale,
The scale of tangents,
The C. I. scale (inverted),
The D. scale,
The scale of equal parts,

By the arrangement of the C. and C. I. scales on the slide with the scale of tangents between, the tangent or co-tangent of any angle from 5° 43′ to 84° 17′ can be read on the slide, or used as a factor if so required.

For Magnifiers and Books on the Slide Rule see page 313.

MAGNIFIER FOR SLIDE RULES.



The Magnifiers are mounted in a metal frame and are applied to the rule by springing them on the frame of the glass indicator. The lens is thus always in position for reading and is always in focus. The magnification is ample for even the finest graduations, the field covers the full area of the indicator and the lines do not appear distorted.

INDICATOR WITH DECIMAL POINTER.



No. 4086.

4086 Glass Indicator with Decimal Pointer . . . . . each $1 00
do. in place of plain Glass Indicator, add . . . . " 50

No. 4086 is furnished for Mannheim and Favorite Slide Rules only.
The Magnifiers, No. 4085 do not fit on these Indicators.

BOOKS ON THE SLIDE RULE.

PUBLISHED BY KEUFFEL & ESSER CO.

4087 B. "The Slide Rule," complete Manual, by Wm. Cox (furnished with Mannheim Rules) . . . . . each $ 50

4087 D. Mannheim Manual (B.), and Directions for Duplex Rule, bound together . . . . . " 75

4087 E. Directions for Duplex and Mannheim Rules, bound together, (furnished with Duplex Rules) . . . . . " 50

10-INCH RULES

4071. Duplex Slide Rule, 10 in., glass Indicator, in Case, with Directions . . . . . each $ 5 00

4071. T Duplex Slide Rule, 10 in., with **trig. scales**, glass Indicator, in Case, with Directions . . . . . " 6 50

16-INCH RULES

4083. Duplex Slide Rule, 16 in., glass Indicator, in Case, with Directions . . . . . " 12 00

4083. T Duplex Slide Rule, 16 in., with **trig. scales**, glass Indicator, in Case, with Directions . . . . . " 15 00

CORRECTION.

For items 4085-A and B. (opposite) please substitute:

4085-A. Magnifier for Mannheim Slide Rules 5 in., 8 in., ... each $2 00

4085 B. Magnifiers for Mannheim 10 in., 16 in , 20 in., Polyphase, Favorite, and Duplex 5 in , 8 in., 10 in. Slide Rules . . . . . " 2 00

4085-C. Magnifiers for Duplex 16 in , 20 in., Log.Log., and Universal 10 in., 16 in. Slide Rules . . . . . " 2 50

K & E Adjustable, Patent Pending.



No. 4092.

4092. Log. Log. Duplex Rule, 10 in., with Directions . . . . . each $ 8 00

The Log. Log. Duplex Slide Rule has, in addition to the scales of the regular Duplex slide rule, a Log. Log. scale, 3 fold, graduated from 1.01 to 22000. with which any root or power of any quantity up to 22000. may be determined by direct operation at one setting of the slide.

Exponentials generally and the many formulas in electrical and mechanical engineering involving fractional powers or roots, hyperbolic logarithms, etc., are readily handled with the help of this scale.

The hyperbolic or natural logarithm of a quantity with its characteristic may be read by means of the indicator without setting the slide, or may be used directly as a factor when required in any formula.

The scales are arranged as follows:

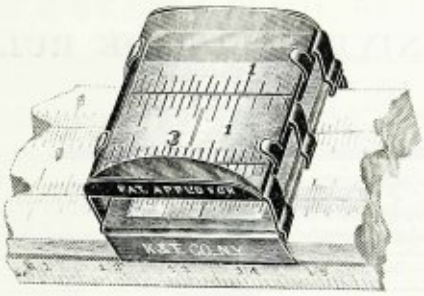
On the front face are the regular A. B. C. D. scales, and a scale of sines in the usual order.

On the reverse face there are, in the order named,
Log. Log. scale, 3 fold,
The C. scale,
The scale of tangents,
The C. I. scale (inverted),
The D. scale,
The scale of equal parts,

By the arrangement of the C. and C. I. scales on the slide with the scale of tangents between, the tangent or co-tangent of any angle from 5° 43′ to 84° 17′ can be read on the slide, or used as a factor if so required.

For Magnifiers and Books on the Slide Rule see page 313.

MAGNIFIER FOR SLIDE RULES.



No. ~~4085 A.~~ 4085 B.

4085 A. Magnifier for 5 in., 8 in. and 10 in. Mannheim, Favorite or Duplex Slide Rules, in Case. . . . . each $2 00

4085 B. Magnifier for 16 in. and 20 in. Mannheim or Duplex Slide Rules, in Case. . . . . " 2 50

When ordering please state for which kind of slide rule the magnifier is wanted.

The Magnifiers are mounted in a metal frame and are applied to the rule by springing them on the frame of the glass indicator. The lens is thus always in position for reading and is always in focus. The magnification is ample for even the finest graduations, the field covers the full area of the indicator and the lines do not appear distorted.

INDICATOR WITH DECIMAL POINTER.



No. 4086.

4086 Glass Indicator with Decimal Pointer . . . . . each $1 00
do. in place of plain Glass Indicator, add . . . . " 50

No. 4086 is furnished for Mannheim and Favorite Slide Rules only.
The Magnifiers, No. 4085 do not fit on these Indicators.

BOOKS ON THE SLIDE RULE.

PUBLISHED BY KEUFFEL & ESSER CO.

4087 B. "The Slide Rule," complete Manual, by Wm. Cox (furnished with Mannheim Rules) . . . . . each $ 50

4087 D. Mannheim Manual (B.), and Directions for Duplex Rule, bound together . . . . . " 75

4087 E. Directions for Duplex and Mannheim Rules, bound together, (furnished with Duplex Rules) . . . . . " 50

UNIVERSAL SLIDE RULE.

Patented.



No. 4090. N

4090. N Universal Slide Rule, 10 in., engine divided, divisions on white facings, with **glass Indicator** in Case, with Manual, each $20 00

4091 Universal Slide Rule, like No. 4090 N, but 16 inches, . . " 30 00

The Universal Slide Rule is graduated on both sides, like the Duplex, from which it differs in having two connected slides, with an intervening graduated guidepiece. The two slides are joined, forming one piece. The indexes at the ends and centre are all in simultaneous alignment. A glass indicator embraces the whole rule. The four top scales on the front face of the rule are the regular Mannheim A, B, C, D scales, the next two scales on contiguous edges are folded logarithmic, *i. e.*, beginning at the centre and progressing to the right to 3.16 and continued from the left index to the centre. The seventh is a scale of sines of angles from 38 minutes to 90 degrees. The natural sines are read on the adjacent eighth scale, a regular double logarithmic scale.

On the reverse side of the rule are nine scales. Scales B, C, are inverted, like those on the reverse side of the regular Duplex Rule. The other scales in their order are

the folded logarithmic scale,
the folded single logarithmic scale inverted,
the scale of equal parts,
the scale of tangents (angles from 5° 43′ to 45°),
the single logarithmic scale,

The advantages of this rule are obvious. As all the scales on the slide move simultaneously, they are always in the same position relative to one another, and by means of the indicator, which embraces the whole rule, any scales on either side may be operated together. Complex arithmetical and trigonometrical calculations can be solved with fewer settings and consequently with greater rapidity and less liability to error than on the usual slide rules.

As the folded logarithmic scale begins and ends at the centre of the rule, the result of a calculation which lies beyond the rule can at once be read off on the folded scale without resetting the slide.

The Manual furnished with the Universal Slide Rule is No. 4087 D , page 313.

METAL SLIDE RULES.

4096. K & E Mannheim Slide Rule, 10 in., engine divided, all metal, with glass Indicator, in Case, with Manual . . . . each $15 00

4098. Duplex Slide Rule, 10 in., engine divided, for arithmetical computations, all metal, with glass Indicator, in Case, with Manual . . . . . " 20 00

K & E STADIA SLIDE RULES.



No. 4100.

4100. K & E Stadia Slide Rule (designed by Wm. Cox), engine divided, 10 in., divisions on white facing, with patent adjustment, in Case, ... each $ 4 50

4101. do. do. but 20 in. . . . . " 12 50

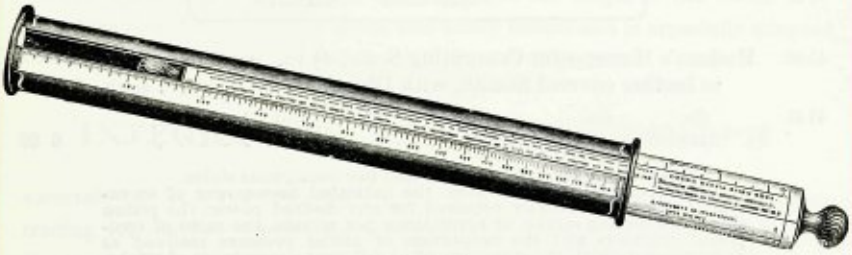
This form of Stadia Slide Rule is remarkable for its simplicity. By one setting of the slide (always to the left), the horizontal distance and vertical height can be in every case at once obtained when the Stadia rod reading and elevation of the telescope are known. The two equations thus solved are those generally used for inclined stadia measurements, viz.:

$$\text{Horizontal Distance} = \text{Rod reading} \times \text{Cos.}^2\,\alpha.$$

$$\text{Vertical Height} = \text{Rod reading} \times \frac{\text{Sin } 2\,\alpha.}{2}$$

The very simple directions are printed on the rule.

WEBB'S STADIA SLIDE RULE.



No. 4105.

4105. Webb's Stadia Slide Rule (cylindrical). . . . . each $ 5 00

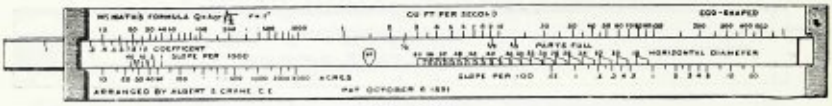
The Webb Stadia Slide Rule is so designed that its capacity and accuracy is equal to that of a straight slide rule of a length of more than four feet, but it has been compacted in a cylindrical form about 15 inches long, diameter 1¼ inches.

It is therefore of a convenient size to carry and use in the field, thus facilitating the drawing of field maps. The desired quantities are given with a degree of accuracy which is commensurate with the probable accuracy of the observations as read, the "logarithmic unit" being 12½ inches long.

The graduations on the wooden cylinder and the metal sleeve are on paper, protected by a hard transparent coating. The directions, which are very simple, are printed on the rule.

CRANE'S SEWER SLIDE RULE.

Patented.

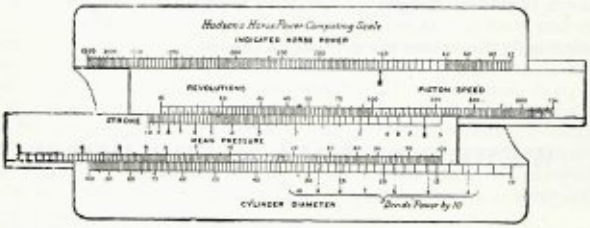


No. 4132.

4132. Crane's Sewer Slide Rule, 10 in., paper facing, with Directions . . . . . each $ 2 00

Crane's Sewer Slide Rule, is based on McMath's formula for amount of storm water and Kutter's formula for capacities, for circular sewers from 6 to 180 in. diam. and eggshaped sewers from 18 to 60 in. horizontal diameter, ratio of radii 3 : 2

HUDSON'S HORSEPOWER COMPUTING SCALE.



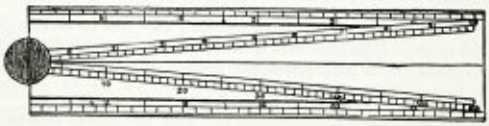
No. 4140.

4140. Hudson's Horsepower Computing Scale, 4½ in., cardboard, in leather covered Sheath, with Directions . . . . . each $ 3 00

4141. do. do. do. do. but boxwood, divided on white facing . . . . . " 6 50

This slide rule consists of a body and two contiguous slides. With it can be found at once: the indicated horsepower of an engine, the size of cylinder required for any desired power, the piston speed due to any stroke, or revolutions per minute, the ratio of compound cylinders and the proportion of initial pressure realized as mean pressure with the steam cut off at different percentages of stroke.

IVORY AND BOXWOOD SECTORS.



No. 4176.

4175. Boxwood Sector, 12 in., brass joint, hand divided . . . each $ 1 00

4176. Ivory Sector, 12 in., German silver joint, " " . . . " 2 25

PLANIMETERS AND INTEGRATORS.

Of all mechanical devices for computation **Planimeters** and **Integrators** rank foremost as the most ingenious and useful aid to the modern Civil, Mechanical, Mining or Marine Engineer.

Planimeters are designed for ascertaining by a simple mechanical operation the area of any plane surface represented by a figure drawn to any scale, such as indicator diagrams, profiles, plans, sections, etc. They are classed in **Polar Planimeters** and **Rolling Planimeters.**

The **Polar Planimeter,** invented by Prof. Amsler in 1856, consists of two principal parts, the **tracer arm,** carrying the tracing point and the carriage with the measuring wheel, and the **pole arm,** to the end of which is affixed the pole, around which the instrument revolves. The area of any figure is readily and accurately obtained by tracing the boundary line with the tracing point, whereupon the result is indicated by the graduated measuring wheel. This original design of the Polar Planimeter has in the course of time been greatly improved and perfected, and its accuracy, utility and range have been greatly increased. As all the Polar Planimeters revolve around a fixed point, their scope is limited by the length of the arms of the instrument, which necessitates measuring large figures in sections. The **Rolling Planimeter** measures by one operation figures of any length and up to a width equal to the length of the tracer arm. It moves in a straight line on broad and heavy rollers and is especially adapted for measuring the area of profiles, deck-plans of ships, etc.

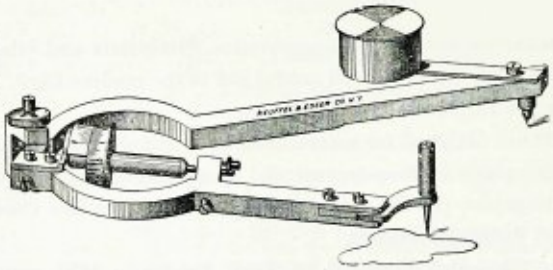
INTEGRATORS AND THE INTEGRAPH

ascertain the Area and Moments relative to any axis of any figure, by simply tracing its outline. They are an invaluable aid to Civil and Mechanical Engineers, Bridge Builders, Naval Architects, etc. They greatly facilitate the finding of the displacement, moments of stability and inertia, centre of gravity, etc., of ships, the tensile strength, resistance, safe load, etc., of cables, tracks, beams and girders, contents of embankments, cuttings, etc. On the Integrators the readings are taken from recording discs. The Integraph draws automatically the integral curves giving a graphic representation of the integration, a feature very valuable to ship builders and others who save computing these curves.

Planimeters and Integrators are so simple, that they can be used by anybody after a little practice. They will soon pay for themselves through saving time and labor, and give more accurate results than any other method.

POLAR PLANIMETERS.

Illustration about ⅓ size.

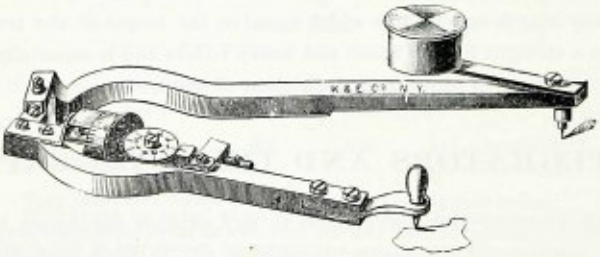


No. 4210.

4210. Polar Planimeter, German silver, fixed tracer arm, improved needle pole*; in polished Mahogany case, with Directions . . . . . each $15 00

No. 4210 represents the Polar Planimeter in its simplest form. It measures up to 10 square inches in tenths and hundredths of a square inch.

Illustration about ⅓ size.

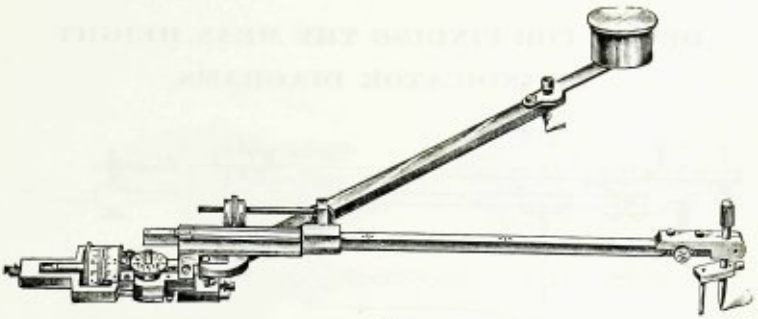


No. 4212.

4212. Polar Planimeter, German silver, fixed tracer-arm, improved needle pole*; with horizontal recording wheel engaging with the measuring wheel and registering its revolutions; in polished Mahogany Case, with Directions . . . . . each $16 50

The horizontal recording wheel registers 10 revolutions of the measuring wheel, so that areas of figures up to 100 square inches can be measured. The areas of small drawings made to scale may be obtained by reduction.

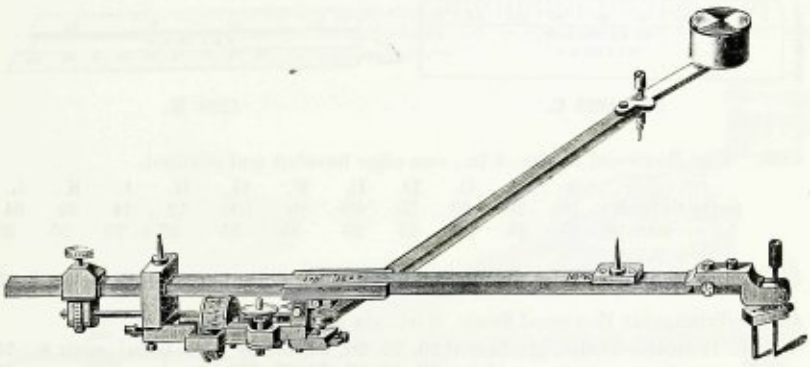
* The improvement of the needle-pole consists in having a counter weight attached to a bar which revolves around the pole, and can be directed to counterbalance the weight of the instrument proper in any position.



No. 4220.

4220. Polar Planimeter (Amsler's pattern), German silver; adjustable tracer-arm about 9 in. with index marks for 4 ratios, and with clamp and slow-motion screw. Improved needle pole; in polished Mahogany Case, with Directions . . . . . each $28 00

This instrument embodies several improvements over the regular Amsler Planimeter. The flange of the roller wheel is at the centre of the wheel axis, thus distributing the wear. The horizontal disc is so placed that it is always visible and not concealed beneath the tracer-arm like on the older style of instruments. The tracer arm is adjustable, and marks for setting to several scales are indicated on it. The tracing point is adjustable, so that it can be brought into alignment with the axis of the roller-wheel it is also provided with a support, which keeps the point just clear of the paper.

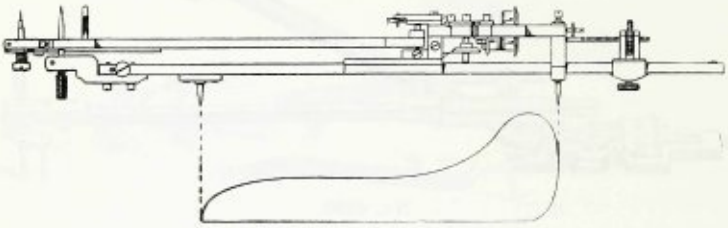


No. 4225.

4225. Polar Planimeter (Amsler's pattern), German silver like 4220, but with special device for rapidly finding the **Mean Height of Indicator Diagrams** (see next page), tracer arm about 9¾ in., in Mahogany Case, with Directions . . each $30 00

Directions (The Polar Planimeter, by Wm. Cox.) . . . . . " 25

DEVICE FOR FINDING THE MEAN HEIGHT OF INDICATOR DIAGRAMS.



(See Nos. 4225 and 4235.)

This device consists of two fine steel points, one attached to the upper side of the tracer arm, and the other to the surface of the carriage in which this arm slides. To obtain the mean height of the diagram, hold the planimeter up-side down and adjust these points so that the distance between them shall coincide exactly with the length of the diagram, then clamp the arm and proceed in the usual way exactly as if the area of the diagram were sought. Instead of giving, however, the area, the setting of the tracers arm is by this means such that the difference of the readings at the beginning and end of the operation, divided by 0.4 is the mean height of the diagram in inches.

Example: Second reading.....4.786
First reading.....4.322

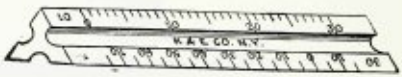
Then 4.786 — 4.322 ÷ 0.4 = 1.16 inches = the mean height.

SCALES FOR INDICATOR DIAGRAMS.

U. S. Standard. Engine divided.



No. 4226 **C.**



4228 **M.**

4226. Flat Boxwood Scales, 4 in., one edge beveled and divided.

	A.	B.	C.	D.	E.	F.	G.	H.	J.	K.	L.
parts to inch:	10	20	40	50	60	80	100	12	24	32	64
each $	25	25	25	25	25	35	35	25	25	25	25

4227. Set of above Scales, in Mahogany Case with numbered slots, set $ 3 25

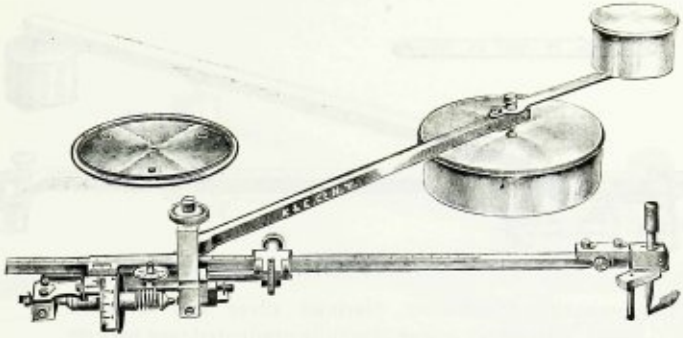
4228. Triangular Boxwood Scale, 3 in., six edges divided.

M. Indicator Scales, graduated 10, 20, 30, 40, 50, 60 parts to in., each $ 75
N. " " " 20, 40, 50, 60, 80, 100 " " " " " 75
O. " " " 10, 15, 25, 30, 40, 70 " " " " " 75
P. " " " 10, 20, 25, 60, 80, 100 " " " " " 75
R. " " " 12, 24, 32, **64**, 40, 60 " " " " " 75

Indicator Scales with other graduations made to order.

METALLIC PAPER

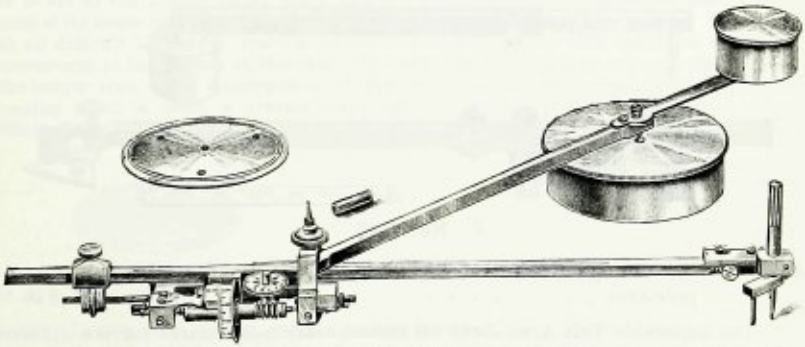
4229. **Metallic Paper** for Indicator Cards, sheets 20 × 25 in., . . . quire $ 2 00
4229C. " " cut blanks, $3\frac{1}{4} \times 7\frac{1}{8}$ in. . . . . " 25



No. 4230.

4230. Improved Polar Planimeter, German silver, adjustable tracer-arm about 8½ in., fully graduated, with vernier and clamp and slow-motion screws; with ball-pole, pole-weight and balancing weight; with testing disc and table of settings for Inches and Metric Measure; in polished Mahogany Case, accommodating the instrument when set to any scale, with Directions . . . . . each $33 35

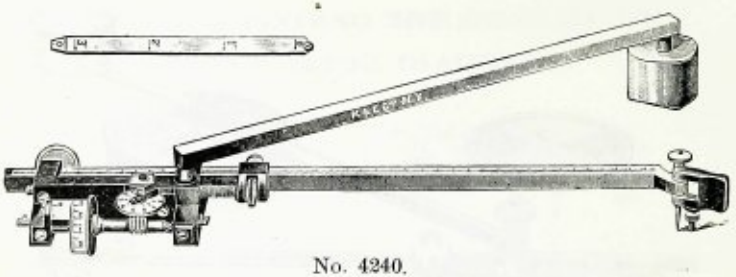
As the tracer-arm is fully graduated, very fine settings can be effected with great accuracy for any scale in U. S. Standard or any foreign measurement, and allowance can be made for the shrinkage of drawings. The tracer-arm is also provided with index marks for a number of scales for Inches and Metric measurements. The Testing Disc greatly facilitates the rapid finding of these settings, and also serves to prove the accuracy of the instrument and as an aid in adjusting it. By shifting the pole weight, which is smooth underneath, the measuring wheel can be easily set to zero. The different parts of the instrument are adjustable and provided with set screws, so that corrections can be made for instrumental errors.



No. 4235.

4235. Improved Polar Planimeter, German silver, like 4230, but with special device for finding the **Mean Height of Indicator Diagrams** (as explained on preceding page) . . . . . each $35 50

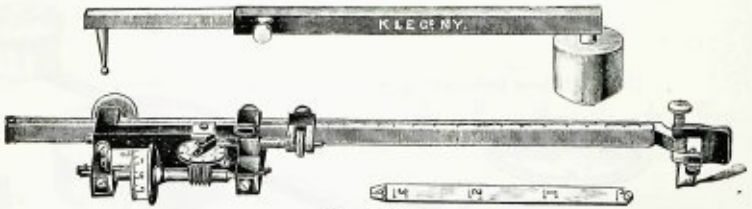
The Steel Points of this instrument when not in use, are protected by German silver caps.



No. 4240.

4240. Compensating Planimeter, German silver and bronzed brass; adjustable tracer-arm fully graduated (see note on preceding page); improved pole-weight; testing rule and table of settings for inches, in velvet lined Case accommodating the instrument set to any scale, with Directions . . . . . each $36 00

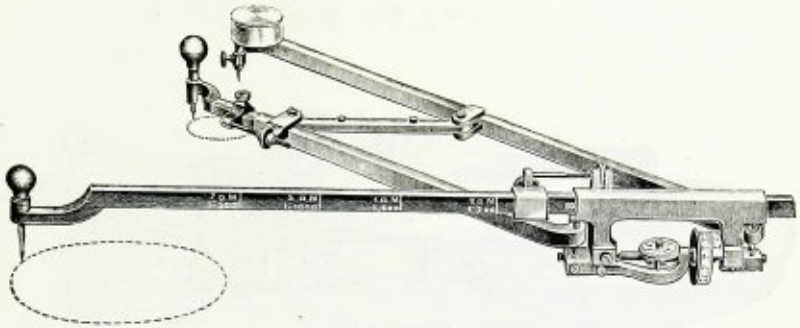
The mechanical construction of this planimeter is unique. The instrument consists of two separate parts; one part is composed of the **tracer-arm** (about 9 inches) and the carriage with the measuring and recording wheels, the other part is the **pole-arm** (about 7½ inches) having at one end the poleweight and at the other end a steel ball, which forms a ball joint with the wheel carriage. This ball joint can not become loose or shaky, nor is it liable to be injured when adjusting the tracer-arm or during shipment, as each part can be handled and is stored in the case separately (see cut below). This construction gives the tracer-arm an angular motion of 180 degrees in either direction, and the range of this instrument is therefore much greater than of the usual planimeters. By measuring a diagram with the pole on the left and then again with the pole on the right side of the tracer-arm and taking the mean of the readings, all instrumental errors are compensated. The pole is of improved pattern, combining the advantages of the pole-weight and needle-pole. The tracing point has also been improved; its construction can be clearly seen in the cut.



No. 4242.

4242. Compensating Planimeter like 4240, but with adjustable pole-arm . . . . . each $46 50

The adjustable Pole Arm, about 9½ inches, bears index marks for the different settings furnished with the instrument, and can be adjusted so that when the instrument is used with the pole inside of a figure, the constant is a round number, 20,000, for any setting. The instrument is used in the same way with the pole inside as with the pole outside, and by tracing the figure with the pole on the right and on the left of the tracer-arm (about 9 inches) and taking the mean of the readings, large areas can be measured with great accuracy. The extensibility of the pole-arm and the great range of the tracer-arm permit of measuring very large figures with the pole outside. By reducing the length of the pole and tracer-arms, the instrument can be used on a very small space.



No. 4246.

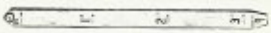
4246. Pantograph Polar Planimeter, German silver, two adjustable tracer-arms with index marks for different ratios, clamp and slow motion screw to each tracer-arm, with needle-pole; in velvet lined Case, with Directions . . . each, $65 00

This Planimeter is especially adapted for measuring very large and very small figures. The long tracer-arm (about 11 in.) has a range covering a circle 38 in. diameter and is used for measuring large figures. It is adjusted to the required scale, and the figure is traced in the usual manner. During the operation the tracing point of the shorter tracer-arm had better be removed.

The smaller tracer-arm (about 7½ in.) is used for measuring very small figures. It is set to the proper index mark and the figure is traced by so **guiding with the tracing point of the longer arm** that the point of the smaller arm follows the outline. This is not at all difficult as the two tracing points travel nearly alike. The setting of the longer tracer-arm is indifferent in this case. The starting point is best taken at the tracer of the longer arm. The construction of the instrument is such, that, when the smaller tracing point is used, a greater travel of the measuring wheel for a given area is effected; consequently the value of the wheel unit is smaller and the result more accurate.



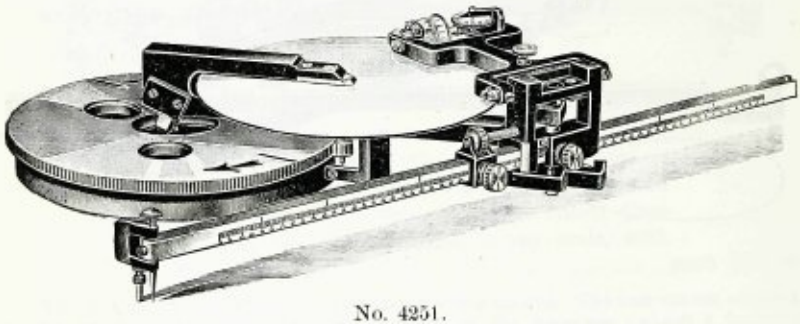
No. 4248.



4249.

4248. **Testing Disc,** brass, with one engraved circle enclosing an area of exactly 4 square inches, with three pins to prevent slipping . . . . . each. $ 2 25

4249. **Testing Rule,** German silver, for radii of 1, 2, 3 and 4 inches, with centre-pin . . . . . each, $ 1 50



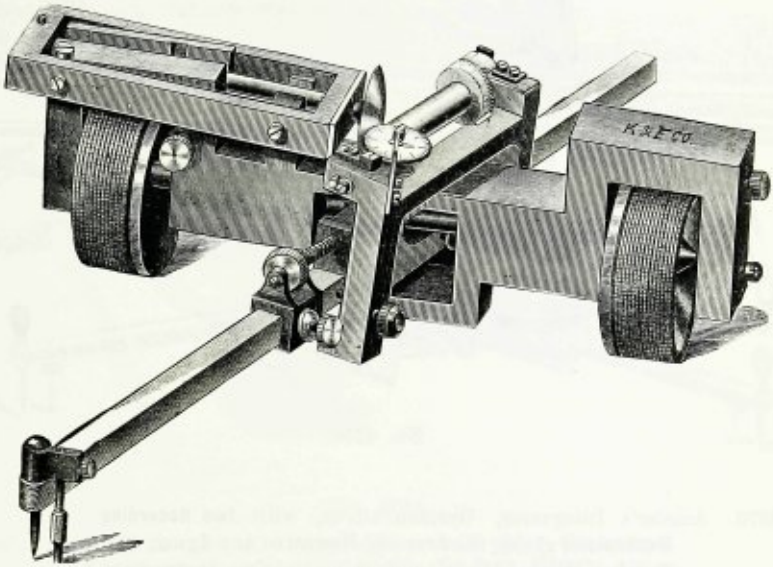
No. 4251.

4251. Precision Polar Disc Planimeter, German silver and brass, with aluminum paper-faced contact disc for the measuring wheel, latest construction, adjustable tracer arm 13¾ in. fully graduated to ½ millimeters, with micrometer screw to vernier reading to $\frac{1}{10}$ millimeter. Heavy pole-weight 5¾ in. diameter, contact disc for measuring wheel 5½ in. diameter, with testing rule and table of settings for inches and metric measure, in leather covered velvet lined Case with Lock and key, with Directions, . each $ 85 00

In this instrument the motion of the measuring wheel is independent of the condition of the paper on which the measured figure is drawn, as the measuring wheel revolves by contact with the plane disc. Reliable computations can therefore be made on plans after they have been folded or rolled. The recording mechanism is the same as on our other large planimeters.

The instrument consists of two parts, the pole-weight and the planimeter proper, connected by a ball joint at the centre of the pole-weight. The motion of the tracer is imparted to a pivot (under the contact disc) which engages the finely toothed rim of the pole-weight, transmitting rotary motion to the contact disc by a thumb screw in its carriage. The hinged carriage can be folded back to facilitate cleaning the disc. Improved tracer point with spring, with a support to keep it clear of the drawing, and winged handle.

ROLLING PLANIMETERS.



No. 4262.

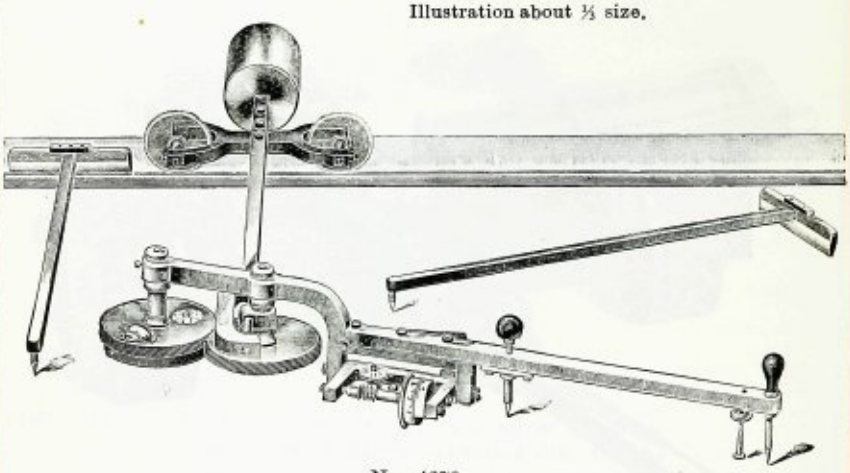
4260. Precision Rolling Planimeter of German silver and brass, adjustable tracer-arm, fully graduated, 10 inches long, with 8-inch telescoping extension piece, with Testing Rule and Table of Settings for inches and metric measure, morocco Case accomodating the instrument when set to any ratio, and with Lock and key; with Directions . . each $82 50

4262. Precision Rolling Planimeter like 4260, but larger, tracer-arm 12 inches long, telescoping extension piece 10 inches " 95 00

The Rolling Planimeter moves on two broad rollers, from one of which motion is imparted to the recording mechanism. The measuring wheel revolves by contact with a polished sphere segment. Only the rollers and the tracer are in contact with the drawing, and the results are therefore not affected by irregularity of the paper. The area of a figure of any length, the width of which does not exceed the length of the extended tracer-arm, can be measured in one operation.

AMSLER'S MECHANICAL INTEGRATORS.

Illustration about ⅓ size.



No. 4270.

4270. Amsler's Integrator, German silver, with **two Recording Mechanisms** giving the **Area** and **Moment** of any figure; two Tracing Points, two Gauges for adjusting instrument to axis of moments; grooved Steel Rail 29 inches; in hardwood Case, with Directions . . . . . each $125 00

4272.* Amsler's Integrator, like No. 4270, but **Brass** . . . . . " 110 00

Grooved Steel Rails of other length furnished to order.

Integrators Nos. 4270 and 4272 give the area and moment of any figure by a simple mechanical operation. They are provided with two tracing points, for large and small figures. The one nearest to the centre of rotation of the instrument effects a greater travel of the measuring wheel; consequently the area value of the wheel unit is smaller and the result more accurate. Large figures can be measured in sections. Area and moment of figures drawn to scale can be easily obtained by means of a formula furnished with each instrument.

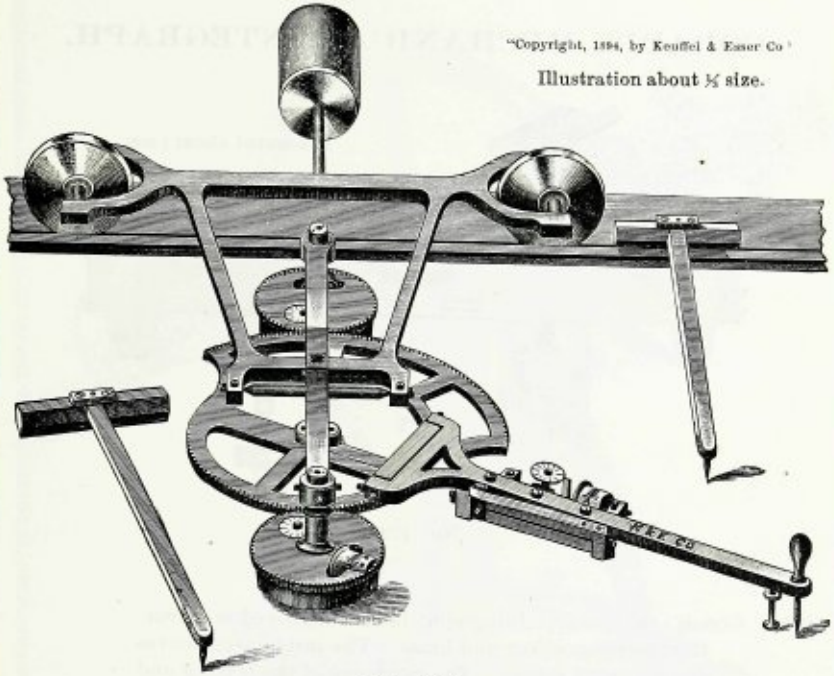
The range of the instrument is:

Longitudinal	26 in.
Transverse	15 in.

*** Integrators marked * are not carried in stock and are imported to order only.**

"Copyright, 1894, by Keuffel & Esser Co."

Illustration about ½ size.



No. 4280.

4280. Amsler's Integrator, German silver, with **three Measuring Wheels with Recording Discs** giving the **Area, Moment,** and **Moment of Inertia** of any figure; two Tracing Points: two Gauges for adjusting instrument to axis of moments; instrument in hardwood Case; grooved Steel Rail, 59 in., in separate hardwood Case; with Directions . . . . each $175 00

4282.* Amsler's Integrator, like No. 4280, but **Brass** . . . . . " 150 00

Integrators No. 4280 and 4282 are provided with a third train of recording wheels, which renders the moment of inertia of the figure measured.

Their range is: Longitudinal . . . . . 50 inches
Transverse . . . . . 13 "

4286.* Amsler's Integrator, like No. 4280, but **Extra Large,** German silver, three Tracing Points, grooved Steel Rail-78 in. each $280 00

4288.* Amsler's Integrator, like No. 4286, but **Brass** . . . . . " 230 00

Integrators No. 4286 and 4288 are practically the same instruments as No. 4280 and 4282, but built on a larger scale, so that they measure proportionately larger figures by one operation.

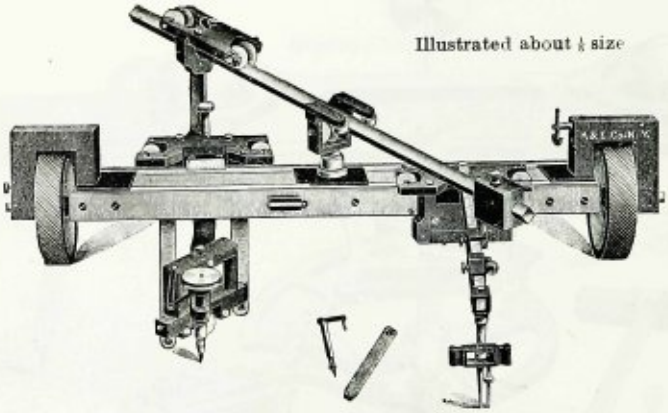
Their range is: Longitudinal . . . . . 67 inches
Transverse . . . . . 26 "

Grooved Steel Rails of other length furnished to order.

*** Integrators marked * are not carried in stock and are imported to order only.**

CORADI'S MECHANICAL INTEGRAPH.

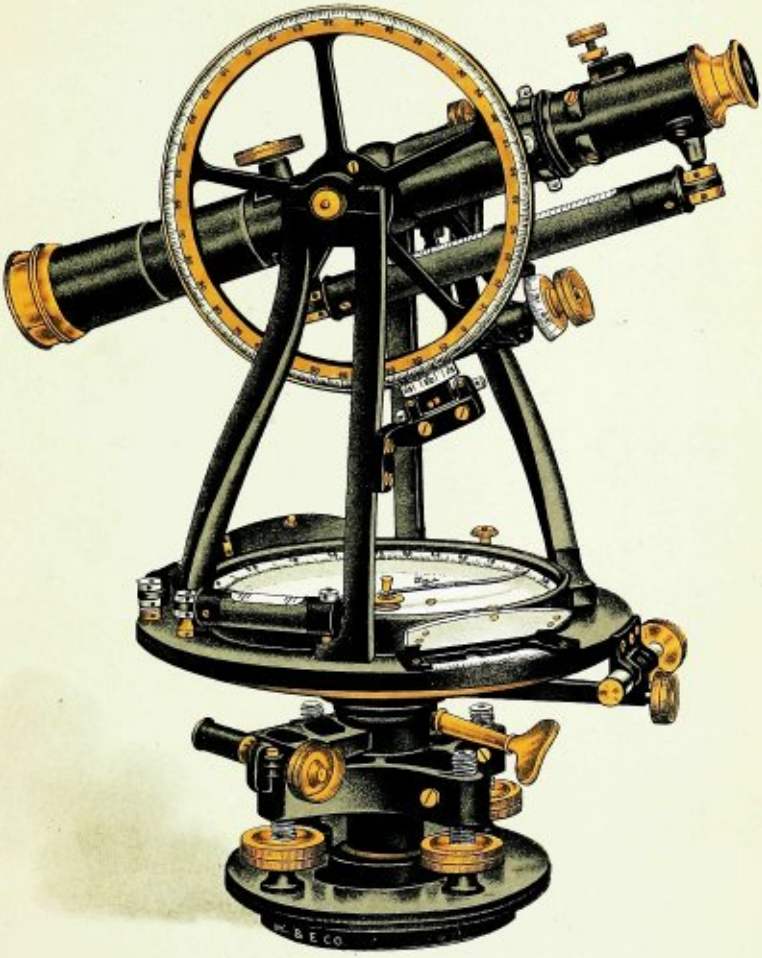
Illustrated about ⅛ size



No 4296.

4296. Coradi's Mechanical Integraph, latest improved construction, German silver and brass. The instrument moves on two broad rollers. The carriages of the tracing and integrating points have a lateral travel of 10.3 in. The tracer arm (base rule) is graduated to $\frac{1}{10}$ inches with vernier reading to $\frac{1}{100}$ inches and micrometer screw. The base can be set from 1.5 to 5.2 inches. Instrument complete, with testing rule, in walnut Case, with Lock and Key, with Directions . . . . . each $175 00

Like the Mechanical Integrators, the Integraph has proved in a comparatively very short time to be an aid of no small consideration to Civil and Mechanical Engineers and especially Naval Architects. The instrument enables them to compute the different moments, curves of stability, etc., etc., like with the Integrator, but in one way it is superior to the latter. **While it is necessary with the Integrator to compute the several curves point by point and to construct them by means of the computed points, the Integraph directly draws the curves on the paper,** thus giving a graphical representation of the integration. The operator traces the outline of the figure, i. e., the differential curve, and the pen or pencil point automatically draws the integral curve. The value of the ordinate of this integral curve can be measured off on the paper or read on a finely graduated bar. This value multiplied by the constant furnished with the instrument, gives the area of the figure. By regarding the new curve as the differential curve and tracing it in the same manner in which the first one was traced, the integral curve of the next higher order is drawn, the ordinate of which multiplied by the constant gives the moment of the original diagram. By repeating this operation, the moment of inertia, moments of the 4th, 5th, etc., order can be readily found. By this means practically all problems of stability, etc., may be solved almost entirely by mechanical operations, and much labor and brain work saved.



PART II
INSTRUMENTS FOR FIELD USE

IMPROVED

SURVEYING INSTRUMENTS

MADE BY

KEUFFEL & ESSER CO.

Our Surveying Instruments, especially Transits and Levels have many important improvements. We constantly endeavor to perfect them and they now represent a specific type of such instruments and excel in Construction, Material, Workmanship and Precision. Many of their features can be found in our instruments only, as they are protected by a number of patents, with others still pending.

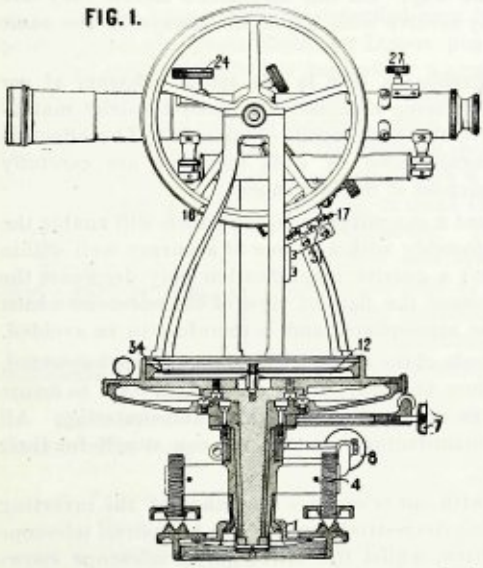
The instruments described and illustrated in this Catalogue are our regular patterns which we carry in stock, but we are prepared to carry out, as far as feasible, any suggestions as to details of construction which the practical experience of our professional friends may lead them to desire. For convenience in ordering special instruments, we describe some of the accessories and attachments which we have made to order from time to time.

The various improvements here described, most of which are specific to our instruments, are applied to all our extra-fine levels and transits. In the other grades some of them are omitted; each series of instruments is described in detail.

GENERAL FEATURES.

The **outer** and **inner centres** of our transits and levels are extra long, to give stability and accuracy. They are made of anti-friction metals, to allow of their moving upon each other with the least possible wear and friction, thus enabling the instrument to revolve on its axis both freely and smoothly. The centres of our instruments are also better protected than those of other construction, on account of our original patented arrangement of the lower or leveling part.

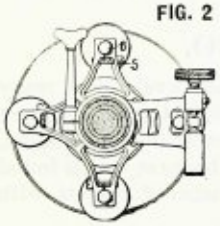
FIG. 1.



The **Half-ball Joint** on our Transits, (Fig. 1, 1,) instead of being attached, as is usual, to the outer centre, forms part of a false sleeve or collar, the upper part of which is screwed to the outer centre, and shoulders on the leveling arms. Between the lower part of the two, there is a small annular space, so that any shock which the instrument may receive from a fall, or otherwise, would be broken by the sleeve of the ball joint, thus protecting the centres.

The **Leveling Arms,** (Fig. 1, 4 and Fig. 2) are so constructed, that if any of them should be bent by a shock or strained by the leveling screws, the delicately fitted centres would not be liable to be affected or injured. Leveling arms have the advantage over the solid plate, that they afford more room for manipulating the screws. The arms, Fig. 2, where they receive the leveling screws, are slotted and can be adjusted by means of set screws, Fig. 2, 5, so that the friction may be made uniform under all conditions of wear and temperature. This construction also affords the advantage that the leveling screws can be firmly locked by tightening the set screws, to protect the instrument against injury from working loose during transportation. The adjustable slots make dust-caps unnecessary as the dust accumulates in the slots from where it can be easily removed. If instruments are ordered with dust-caps, we furnish these without extra charge.

FIG. 2



The **Clamps** for the limb and centre (Fig. 1) clamp absolutely and without injuring the parts. Each one is provided with an improved slow-motion tangent screw, Fig 1, 8 and Fig. 2, permitting of very delicate motion of the plates. These screws are made of German silver almost as hard as steel. The threads are cut on a special lathe with precision screw, thus securing a very accurate and durable thread. The heads of the clamp screws and their tangent screws are so placed that they are easily accessible but still well protected and out of the way. On our Engineer's Levels they are attached to the bar, so that they revolve with it and are always in the same relative position.

Telescopes. — Particular attention is paid to the optical efficiency of our instruments, each type of telescope being especially designed by strict mathematical calculations, so as to give the best results obtainable. The effective aperture, focal length and magnification of each telescope are carefully chosen in accordance with the purpose of the instrument.

We give to each instrument a magnifying power which will enable the observer to sight easily and comfortably with a degree of accuracy well within that required by the instrument; a greater magnification only decreases the brightness of the image and lessens the field of view of the telescope whilst accentuating the vibration of the atmosphere, and is therefore to be avoided.

The telescope lenses are made of the best optical glass and are subjected, both during manufacture and when finished, to the most rigid tests to insure perfection of material as well as of grinding, polishing and centering. All optical parts are entirely of our manufacture, so that we can vouch for their quality to the fullest extent.

The eyepieces we supply with our telescopes are either of the inverting (astronomical), or of the erecting (terrestrial) type. The terrestrial telescope shows objects in their right position, whilst the astronomical telescope shows the image inverted. Therefore the terrestrial telescope is more convenient to use than the astronomical one; on the other hand, the latter has a larger and more even field. The inverting eyepiece is considerably shorter than the

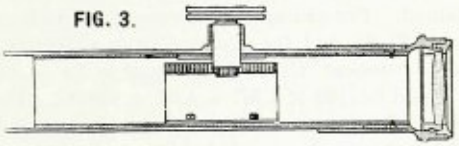
erecting and thus allows of a greater focal length for the objective, which is a considerable advantage, particularly for stadia work. Being constructed of only two separate lenses or lens combinations, as against four in the erecting eyepiece, it has fewer internal reflections, and thus gives a more brilliant image than the erecting eyepiece.

The mechanical design of our telescopes is such that all light rays falling on the object glass within the angle of view pass unobstructed through the instrument and actually contribute to the image, care being taken that no light is cut off by an unsuitably shaped objective mount, badly placed diaphragms, or other obstruction inside the telescope tube.

We absolutely guarantee our telescopes to have best definition over the entire field. Should any of our telescopes be found lacking in this respect it could only be the result of some accident to the telescope, in which case the telescope should be immediately returned for correction.

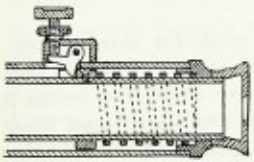
Rack to Objective. The objective is focused by a patented contrivance consisting of a rack with compensating spring, which takes up all lost motion, and a pinion with adjustable anti-friction mounting. This insures easy and *accurate* working, without binding (Fig. 3). The slide of the objective, which is guided in accurately ground rings, is extra-long and can be extended very far to permit of focusing on near points. (See also Focus Reducing Lenses, page 398.)

FIG. 3.



The **erecting eyepiece** is focused by a screw acting on a bell crank with counter spring, (Fig. 1, 27, and Fig. 4.) This is a simple and ingenious improvement, delicate and positive in action, which allows very nice adjusting, without the objectionable features of the ordinary rack and pinion or of the spiral motion. The focusing screw is provided with a lock nut operated by an adjusting pin, to make the adjustment permanent for the same observer. The milled heads for focusing the objective and eyepiece are placed on top of the telescope, Fig. 1, 24 and 27, to make them conveniently accessible for either hand, but when especially ordered, we can place them on either side of the telescope, or under it.

FIG. 4.



Stadia Hairs. The relation between the size and distance of an object and the size of its image in a telescope is given by the formula

$$\frac{Y^1}{Y} = \frac{F}{X}, \qquad or \quad X = \frac{F.y}{Y^1}$$

where Y denotes the linear size of the object, Y^1 that of its image (the distance of the stadia wires in this case) F the focal length of the objective and X the distance of the object (the rod) from the first principal focal point. This point lies in front of the objective at a distance nearly equal to its focal length. To reduce the measured distance X to the true distance from the center of the

instrument, add to X a **constant** equal to the distance of the first principal focal point from the center of the instrument.

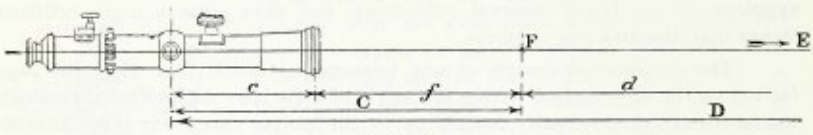


FIG. 5.

The stadia hairs in our transits are adjusted in the proportion $\frac{Y^1}{F} = \frac{1}{100}$, to intercept one foot at a distance of 100 feet, or one meter at a distance of 100 meters, etc. This proportion reduces the above formula to the simple relation $X = 100\ Y$, to which must be added the constant (C) as explained. For example, assuming the stadia reading to be 1.37, the focal length (F) .62, and the distance from objective to centre of the instrument .45 then the constant (C) would be equal to .62 + .45 = 1.07, and the total distance (D) would be (100 × 1.37) + 1.07 = 138.07. The value of this constant which is correct for distances beyond about 100 feet, is stated on the label in the box of each instrument provided with stadia hairs. For sights not on the horizontal, the horizontal distance must be computed, which can be readily done by means of the stadia slide rule. (See page 315.)

All our transits, No. 5030 to 5088, are furnished with stadia hairs. Stadia hairs for other instruments must be specially ordered. For prices see page 399.

Adjustable Stadia Hairs. While we can furnish adjustable Stadia Hairs to order, we advise against their general use, as it is difficult to keep them in adjustment. They are listed on page 399.

Disappearing Stadia Hairs (stadia hairs not in the same focal plane with the cross hairs) are listed on page 399.

The **Level Vials** (spirit levels) are of special glass made for this purpose. They are ground to a true curve and contain a very light fluid which is very mobile and will not form a sediment. Each vial is carefully tested before it is placed into the instrument. The telescope level vials are longer than those usually employed and all vials are graduated on the glass and are sensitive in keeping with the grade of the instrument. The sensitiveness of each level vial is marked on it in seconds of arc per graduation.

It should be borne in mind that the accuracy of the results obtainable, if the instrument be otherwise well made, depends on the sensitiveness of the bubbles, and that the results can not be accurate if the bubbles do not readily respond to the slightest change in adjustment. Coarse and sluggish bubbles are easily brought into **apparent** *adjustment, but the actual results obtained with them are very uncertain. Even when fine and sensitive bubbles seem to be a "little out", the actual results are far better than those obtained with sluggish bubbles which* **seem** *to indicate perfect adjustment.*

The **Gradienter Screw** is an adaptation of the ordinary clamp and tangent screw. The silvered edge of the head is divided generally into 100 parts, and the pitch of the screw and the length of the clamp arm are so predetermined, that one complete revolution of the micrometer head raises or lowers the line of sight of the telescope 1 foot vertically in a horizontal distance of 100 feet. A graduated bar opposite the graduations on the screw head indicates the number of complete revolutions of the Gradienter screw. (See cut of No. 5062, page 356.)

TRANSITS.

Our Transits are extremely strong in all their parts and very rigid, owing to their improved construction, and are as light as is compatible with absolute stiffness and rigidity.

The **Lower Plate** is a substantial ribbed casting, which bears on its upper surface the **horizontal limb.** The graduations on the horizontal and vertical limbs of our Transits and on the compass ring of our extra-fine Transits are on solid silver. On the horizontal limb the inner circle of numbers is on the solid silver while the outer one is on the casting. Our instruments are numbered as illustrated under fig. IV, page 336. Unless another method of numbering is ordered, the two circles of figures are slanted in opposite directions.

GRADUATIONS.

We graduate our Transits, etc., on automatic dividing engines of our own design and construction. The uniformity and accuracy of our graduations has won for our instruments an almost unique position among users of precision instruments, including many branches of the U. S. and Municipal Governments and scientific institutions of the highest standing.

The **Verniers** are placed at about 45 degrees with the telescope, without lessening the firmness of the standards, owing to our improved and patented construction. The two opposite verniers each read both right and left. They are protected by a cover glass and provided with a hinged metal shade,(Fig. 8, 10 and 11,) which protects the vernier glasses and, being lined with a white material, serves as reflector when reading the graduations.

The **Compass Circle** is beveled towards the centre, graduated to half-degrees and numbered in quadrants from 0 to 90. The graduations of the compass in our extra-fine transits are on solid silver on a beveled rim.

The **needle** is bent upwards at the ends (Fig. 1, 34,) as this permits of closer reading. It has jeweled centre, is wider near the points than at the middle, and is more sensitive than any edge-bar or flat needle can be, as this shape holds its magnetism better. The milled head, for raising and lowering the needle, is small and so placed as to be as much as possible out of the way. The needle bears on its south end a few turns of light silver wire, to compensate the magnetic dip (for the northern hemisphere). This wire can be shifted to correct for changes in the inclination, which varies in different localities. Our instruments are shipped adjusted for the inclination at New York.

Variation Plate.—Much care has been bestowed upon the mechanism for setting off the variation (declination) of the needle. The compass ring is moved by means of a pinion, the shaft of which extends above the top plate and has a small capstan-head, (Fig. 8, 3,) operated by an adjusting pin, which means of adjustment is much more delicate than the old style milled thumbnut and is less liable to be disturbed. For this adjustment we furnish a special non-magnetic adjusting pin of phosphor bronze to avoid the deflecting of the needle which a steel pin would cause The accurate setting-off of the variation is effected by a graduated arc on the face of the compass plate in conjunction with a graduation on the vertical rim of the compass box. **The compass of all our transits is provided with this improved variation plate.**

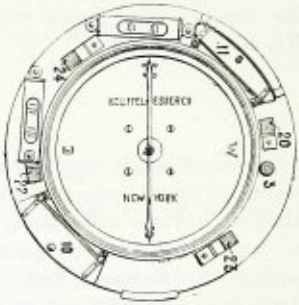


Fig. 8.

To remove the compass glass : The cover-glass of the compass fits snugly and is set in soft cement, to prevent the entrance of moisture. This cement offers but slight resistance in removing the glass, which can be lifted off by means of a piece of wood temporarily glued or cemented to it for that purpose.

The **Standards** each consist of one inclined and one nearly vertical twisted leg, (Fig. 1). They are well spread and their feet are placed close to the compass box (Fig. 8, 21, 22, 23, 24,) where the top plate is strongest and offers the most substantial support, insuring the telescope being steady and free from vibration. The advantages of the bent standards, which were originated by us, are now so universally recognized that we need not comment on this elegant and distinctive feature of our transits. To those who are interested in the subject, we will send, on request, a detailed report on the comparative tests of the two styles of standards.

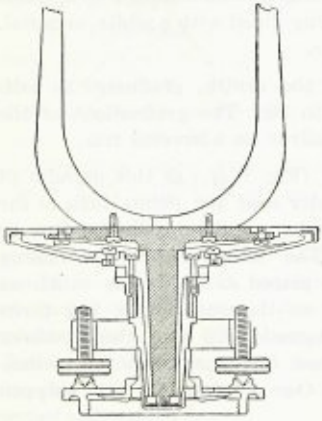


Fig. 9.

U-Shaped Standards.—Our transits with U-shaped Standards (Fig. 9,) are of improved patented construction. The standards are directly and rigidly mounted on the **flange of the inner centre** and are thus, practically, a part of it. The vital importance of this improvement is obvious, as it insures the greatest steadiness of the telescope.

The **Vertical Limb,** which is reinforced by a rib at the back, is divided on its surface, but not up to its edge as is usual (Fig. 1, 16). By our construction the silver is laid in and therefore protected by the bronze edge of the limb. The beveled **vernier** is hinged on adjustable pivots, (Fig. 1, 17). It can be lifted off the graduations to prevent wear while pointing the telescope (Fig. 1, 31) and will yield in case of distortion of the plane of the limb.

THREE LEVELING SCREWS

We have improved the construction of the leveling head of instruments with 3 screws, dispensing with the usual cumbersome construction, by substituting an extremely simple and efficient device without loose parts. Our three-screw transits have shifting centre and they, as well as the levels, can be mounted on their tripod as readily as the instruments with four screws. (See cut, page 370.)

CLOTH FINISH

Besides the instruments which we list with cloth-finish we furnish to order, without extra charge, Transits with cloth-finish standards, and Levels with cloth-finished bar, telescope and spirit level case. When so ordered, we can furnish also the telescopes of our transits with cloth finish. The cloth finish has the advantage that it neither conducts heat nor reflects light.

ALUMINUM

We make to order Surveying Instruments of Aluminum, employing this metal for all parts for which it is adaptable. Price quoted on application.

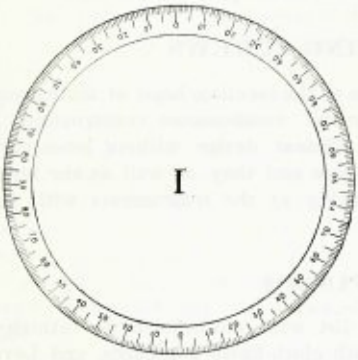
ENGINEER'S RAILROAD TRANSITS

The above description refers principally to our extra-fine transits which are of the highest grade in every respect and of the greatest precision. They have all our patented improvements, and we consider them the best made. Besides these instruments we make another series, described on pages 395, etc. They are also of fine quality and workmanship, and, while they do not have all our latest improvements, they will compare favorably in precision and durability with most other makes of instruments. We state in the separate description of each instrument which improvements it has.

BUILDERS' TRANSITS

Our Builders' Transits meet the demand for a well-made and durable transit instrument at a very moderate price, but still reliable for its intended purposes. They hold their adjustment well, are simple in manipulation and give good results also when used by others than experts. They are listed on pages 392, 393.

Numbering of Limbs.



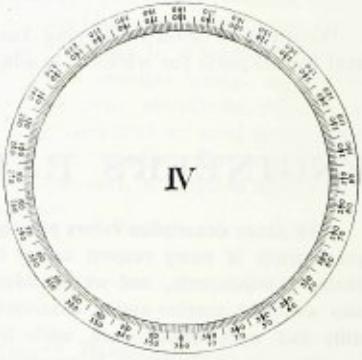
Vertical limb,
numbered in quadrants.



Horizontal limb,
numbered 0—360.



Horizontal limb,
numbered 0—360
and in quadrants.



Horizontal limb,
numbered 0—360
and 360—0.

The above illustrations show some of the various methods of numbering the graduations of the horizontal and vertical limb of transits. Unless other methods of numbering are specified in the order, *we furnish our transits with the horizontal limb numbered double in opposite directions from 0 to 360° like cut IV and the vertical limb numbered in quadrants like cut I*, which is the most generally preferred mode of numbering.



The two rows of numbers of the horizontal limb slant (incline) in opposite directions corresponding to the direction in which the vernier reads for each row of figures, instead of being placed radial like in the following illustrations of verniers.

GRADUATIONS.

Correct and distinct graduations of the limbs and well-combined verniers are of great importance in all surveying instruments. The following illustrations represent the different styles adopted by us for our Transits and Architect's Levels; they will be found convenient in arrangement and easy to read. They are in detail as follows:

Style.	Reading of the Limb.	Divisions of the Limb.	=	Divisions of the Vernier.	Reading of the Vernier.	Kind of Vernier.
A.	Degrees	11	=	12	5 minutes	Double direct
B.	30 minutes	29	=	30	1 "	" "
C.	20 "	39	=	40	30 seconds	" "
D.	20 "	59	=	60	20 "	Folded.
E.	30 "	29	=	30	1 minute	"

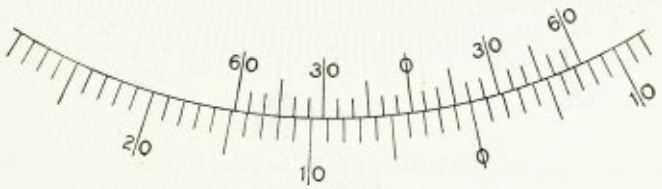
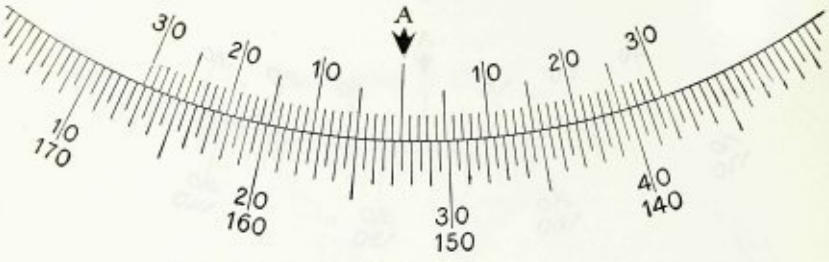


Fig. A.

The above figure represents the method of graduating the horizontal circle of our Architect's or Builder's Levels, with the corresponding vernier. This vernier, which is a double-direct **vernier**, reads from the centre only to either extreme 60 division, that scale being used in which the direction of the numbering corresponds to the direction in which the limb is numbered and read. The limb is divided into degrees and the vernier (from zero to 60) comprises 12 divisions, the least count or reading of the venier is 60 minutes ÷ 12 = 5 minutes.

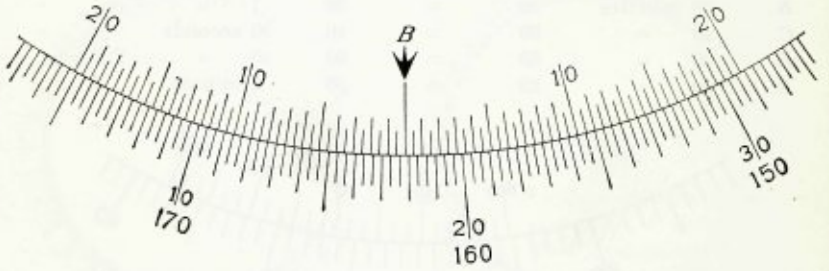
The figure reads 3° 00′ + 50′ = 3° 50′ from right to left.



Style *B*.

Style *B* represents the usual graduation of the horizontal limb of an Engineer's Transit with its vernier. This is an ordinary **double direct vernier,** reading from the centre only, to either extreme 30 division; it is in fact two single verniers, that scale being used in which the direction of the numbering corresponds to the direction in which the limb is numbered and read. The limb is divided into half-degrees, and the vernier (from zero to 30) comprises 30 divisions, therefore the least count or reading of the vernier is 30 minutes ÷ 30 = single minutes.

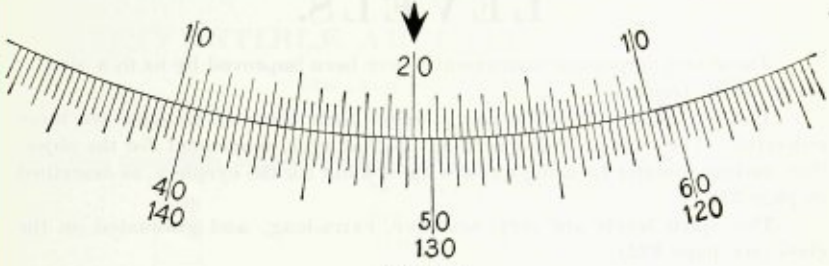
The figure reads 27° 00′ + 25′ = 27° 25′ from left to right, and 152° 30′ + 05′ = 152° 35′ from right to left.



Style *C*.

Style *C* represents the graduation and vernier of an Engineer's Transit, having finer divisions than style *B*. This also is a **double direct vernier,** reading from the centre arrow to either extreme 20 division. The horizontal limb is numbered both ways thus indicating the scale of the vernier to be used. The limb is divided into equal parts of 20 minutes each, and there are 40 divisions in the vernier, consequently the least count or reading of the vernier is 1200 seconds ÷ 40 = 30 seconds.

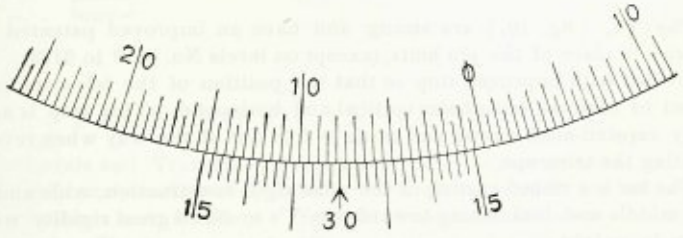
The illustration reads 17° 40′ + 12′ 30″ = 17° 52′ 30″ from left to right, and 162° 00′ + 7′ 30″ = 162° 7′ 30″ from right to left.



Style *D*.

Style *D* represents part of the horizontal limb with the vernier of an Engineer's Transit having still finer divisions than those of style *C*. This vernier is a **folded** one reading from the centre, indicated by the arrow, to either of the extreme 10 division, and then forward in the same direction from the other 10 division to the centre division 20, the direction being determined by the figuring and reading of the limb. The limb is divided to 20 minutes, whilst the vernier is composed of 60 equal parts, consequently the least count or reading of the vernier is 1200 seconds ÷ 60 = 20 seconds.

The figure reads 49° 00′ + 14′ 20″ = 49° 14′ 20″ from left to right, and 130° 40′ + 5′ 40″ = 130° 45′ 40″ from right to left.



Style *E*.

Style *E* represents a portion of the vertical limb or arc of an Engineer's Transit with its vernier. The available space in these being limited, a **folded vernier** is used like style *D*, reading exactly in the same manner. The limb or arc is graduated to half-degrees, and the vernier is divided into 30 equal parts, so that the least count or reading of the vernier is 30 minutes ÷ 30 = single minutes.

The figure reads 7° 30′ + 21′ = 7° 51′ from right to left.

We are prepared to furnish to order transits with the circle graduated 100 parts to the quadrant (the so-called decimal division of the circle), also transits with verniers reading to 50ths, 100ths or 200ths degrees.

LEVELS.

These very important instruments have been improved by us to a similar extent as the transits.

The telescopes of levels, being longer than those of transits, are more powerful. They are provided with our patent rack movement for the objective, and micrometer focusing screw with lock nut for the eyepiece, as described on page 331.

The spirit levels are very sensitive, extra-long, and graduated on the glass (see page 332).

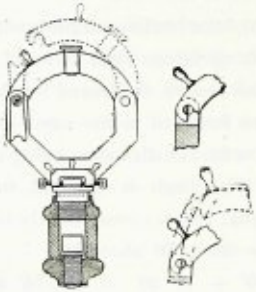


FIG. 10. FIG. 11.

The **Y's,** (fig. 10,) are strong and have an improved patented locking device in place of the pin bolts, (except on levels No. 5118 to 5123). They are provided with improved stop so that the position of the telescope can be adjusted to have the cross-hairs vertical and horizontal. This stop is adjustable by capstan-head screws and made to fold out of the way when reversing or rotating the telescope.

The **bar** is a ribbed casting of the most rigid construction, wide and deep at the middle and diminishing towards the Y's to afford great rigidity without increase in weight.

The Engineers' Dumpy Level (page 343) is finding favor with many engineers, as it requires but little adjusting if it is carefully handled.

The Precision Y Levels (pages 349, 351) represent the latest developments in this class of instruments, especially No. 5027 which is made after the precision level designed and used by the U. S. Coast and Geodetic Survey.

ENGINEER'S RAILROAD LEVELS

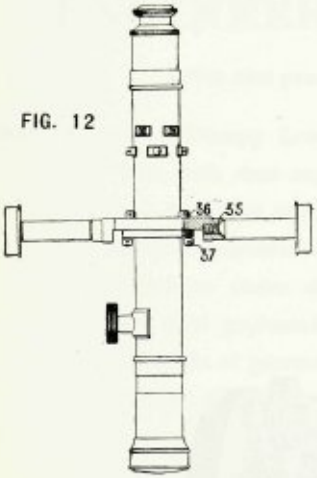
The above description refers principally to our extra-fine levels which are of the highest grade in every respect and of the utmost precision. They have all our patented improvements, which apply to levels and we consider them the best made. Besides these levels we make another series, described on page 391, etc., also of fine quality and workmanship, which while they do not have ALL our latest improvements, will compare favorably in precision and durability with most other makes of instruments.

CONVERTIBLE ARCHITECT'S LEVELS

(See pages 388, 389, etc.)

Our **Convertible Architect's Levels,** through their patented arrangement, can be used also for sighting objects above or below the horizontal plane and for sighting vertical lines. At the middle of the telescope there is a bearing piece with a threaded socket at each side, into which strong trunions can be screwed, to form a rigid axis at right angles to the telescope. The further ends of the trunions have bearing surfaces which fit into the Y's and can be clamped there, like the collars of the telescope. When they rest in the Y's, the telescope can be moved in altitude, so that vertical lines may be determined, and also horizontal angles between two points not in the same plane. When the instrument is used as a Level, the trunions are removed and placed in the box. Architects and Builders will find this addition a very useful one and well worth the extra cost.

FIG. 12



PACKING OF INSTRUMENTS

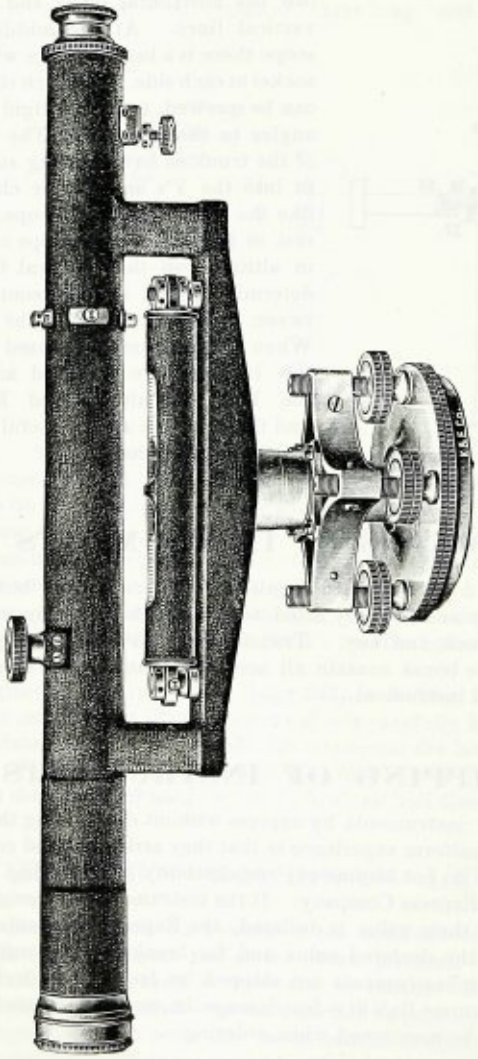
Our Levels and Transits are furnished with mahogany boxes, in which they are accurately and securely fitted, to protect them during transportation. The boxes have lock and key. Transit boxes have also safety hooks with patent catch. The boxes contain all accessories and tools, as stated in the description of each instrument.

SHIPPING OF INSTRUMENTS

We ship our instruments by express without designating the contents on the cases and our uniform experience is that they arrive in good condition when so shipped, but we do not assume any responsibility after having delivered the instrument to the Express Company. If the instruments are designated as such on the boxes and their value is declared, the Express Companies assume the responsibility for the declared value and for breakage, in consideration of a higher rate. When instruments are shipped by freight and declared as such, the carriers also assume liability for damage in transit. If such declaration is desired, it must be mentioned when ordering.

EXTRA-FINE

ENGINEER'S DUMPY LEVEL



No. 5002.

EXTRA-FINE

ENGINEER'S DUMPY LEVEL

(See also general description, page 329 etc.)

5002. Engineer's Dumpy Level, achromatic terrestrial **telescope 18 in.**, with dust cap and sun shade, **object-glass 1⅝ in.**, with improved rack-movement, erecting **eyepiece** with patent micrometer focusing arrangement with lock nut, placed on under side of telescope. Fine, sensitive **spirit level** graduated on the glass, adjustable vertically. The **bar** is of gunmetal and shaped to combine greatest strength with least weight. Very stout supports to telescope. The **leveling screws** are of German silver. The barrel of the telescope and its supports, the tube of the spirit level and the bar are cloth-finished.

Instrument complete, with adjusting pins, waterproof cover, etc., in fine polished mahogany Box and with No. 5178 Split Tripod . . . . . $ 90 00

5003. Engineer's Dumpy Level, like No. 5002, but with Improved **Clamp and Tangent Screw** with counter-spring, to centre, attached to bar to revolve with it 100 00

5002 A. Engineer's Dumpy Level, like No. 5002, but with **astronomical** (inverting) **telescope,** made to order only . . . 90 00

5003 A. Engineer's Dumpy Level, like No. 5003, but with **astronomical** (inverting) **telescope,** made to order only . . . 100 00

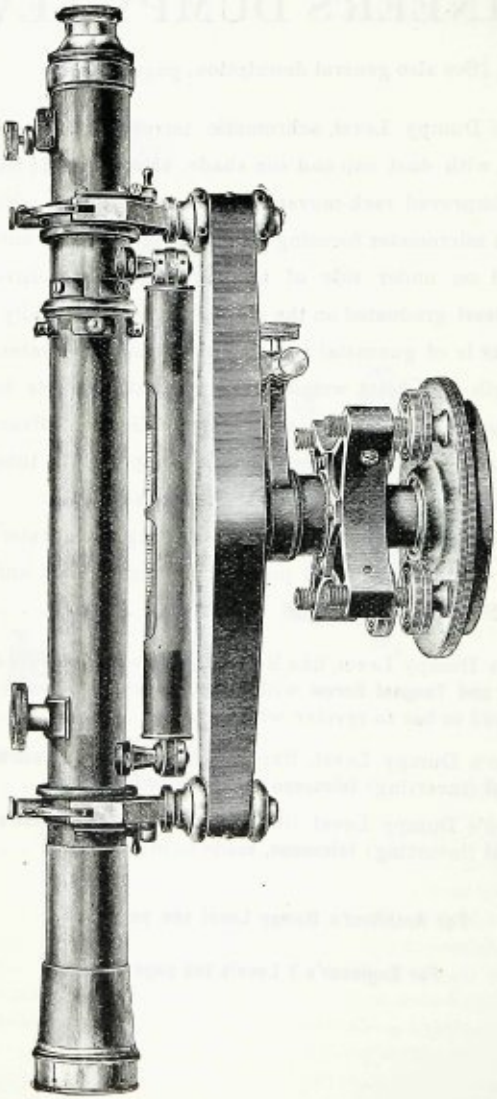
For Architect's Dumpy Level see page 385.

For Engineer's Y Levels see page 345.

EXTRA-FINE

ENGINEER'S Y LEVEL.

(Four Leveling Screws)



No. 5010.

EXTRA-FINE

ENGINEER'S Y LEVELS.

(Four Leveling Screws)

(See also general description, page 329 &c.)

5005. Engineer's Y Level, achromatic terrestrial **telescope 15 in.**, with dust cap and sun shade, **object-glass 1 5/16 in.**, with improved rack-movement, **eyepiece** with patent micrometer focusing arrangement with lock nut. Fine sensitive **spirit level** graduated on the glass, adjustable vertically and horizontally. The **bar** is of gun-metal and shaped to combine greatest strength with least weight. The telescope rests in **Y's**, one of which is adjustable for altitude and position; they are provided with improved adjustable hinged **stop** for so placing the telescope, that the cross-hairs are vertical and horizontal. It is locked in the Y's by a patented arrangement dispensing with the pin bolts. The **leveling screws** and the **clamp and improved tangent screws** with counter-spring are of German silver. The tangent screw is attached to the bar and revolves with it, so that it is always equally accessible.

Instrument complete, with adjusting pins, water-proof cover, etc., in fine polished mahogany Box and with No. 5177 Split Tripod . . . . . $ 100 00

5010. Engineer's Y Level, like No. 5005, but **telescope 18 in., object-glass 1⅜ in.**, with No. 5178 Split Tripod 130 00

5012. Engineer's Y Level, like No. 5010, but **telescope 20 in., object-glass 1½ in.**, with No. 5178 Split Tripod 135 00

5013. Engineer's Y Level, like No. 5010, but **telescope 22 in., object-glass 1¾ in.**, with No. 5178 Split Tripod 140 00

The above levels with **steel centre**, made to order only, extra 10 00

The above levels with **astronomical** (inverting) **telescope**, made to order only . . . . . extra 10 00

For above instruments with three leveling screws see page 347.

For Precision Y Levels see pages 349, 351.

For Engineer's Dumpy Levels see page 343.

For Engineer's Railroad Levels see page 391.

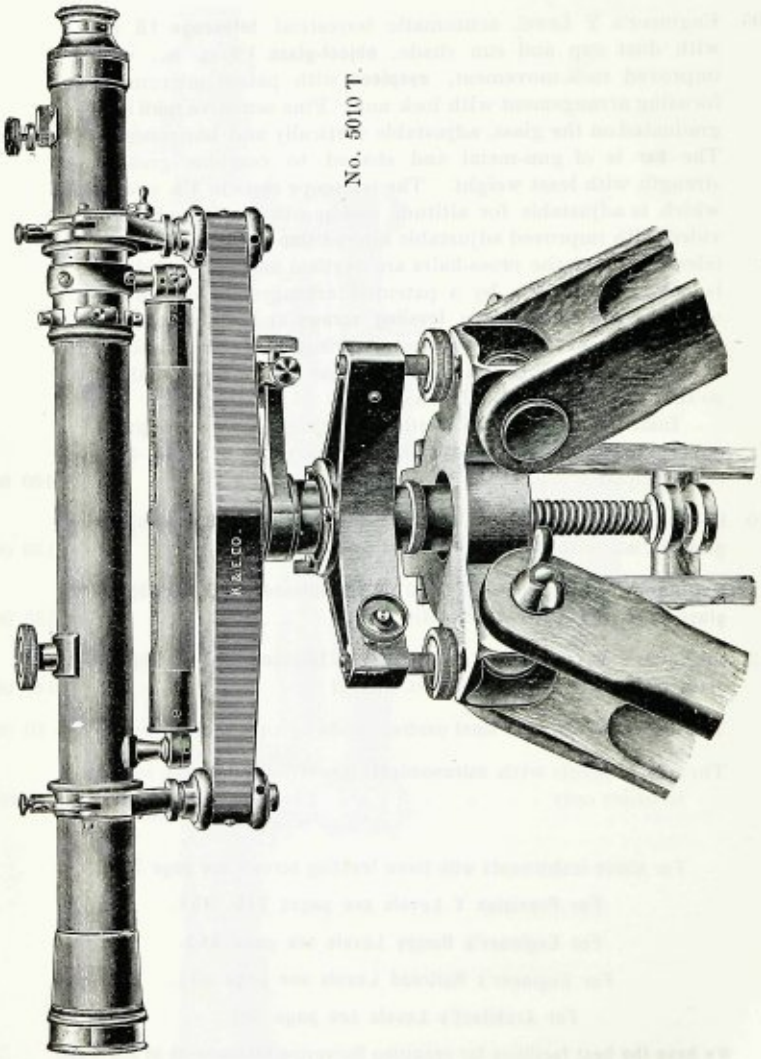
For Architect's Levels see page 385.

We have the best facilities for repairing Surveying Instruments of any make.

EXTRA-FINE

ENGINEER'S Y LEVEL.

(Three Leveling Screws)



EXTRA-FINE

ENGINEER'S Y LEVELS.

(Three Leveling Screws.)

MADE TO ORDER ONLY.

(See also general description, page 329 &c.)

5005 T. Engineer's Y Level, achromatic terrestrial **telescope 15 in., object-glass $1\frac{5}{16}$ in.**, like No. 5005, but with **three leveling screws.**

Instrument complete, with No. 5177 Split Tripod . . . $ 115 00

5010 T. Engineer's Y Level, achromatic terrestrial **telescope 18 in., object-glass $1\frac{3}{8}$ in.**, like No. 5010, but with **three leveling screws.**

Instrument complete, with No. 5178 Split Tripod . . . 145 00

5012 T. Engineer's Y Level, achromatic terrestrial **telescope 20 in., object-glass $1\frac{5}{8}$ in.**, like No. 5012, but with **three leveling screws.**

Instrument complete, with No. 5178 Split Tripod . . . 150 00

5013 T. Engineer's Y Level, achromatic terrestrial **telescope 22 in., object-glass $1\frac{3}{4}$ in.**, like No. 5013, but with **three leveling screws.**

Instrument complete, with No. 5178 Split Tripod . . . 155 00

The above levels with **steel centre** . . . . . extra 10 00

The above levels with **astronomical** (inverting) **telescope**, made to order only . . . . . extra 10 00

For above instruments with four leveling screws see page 345.

For Precision Y Levels see pages 349, 351.

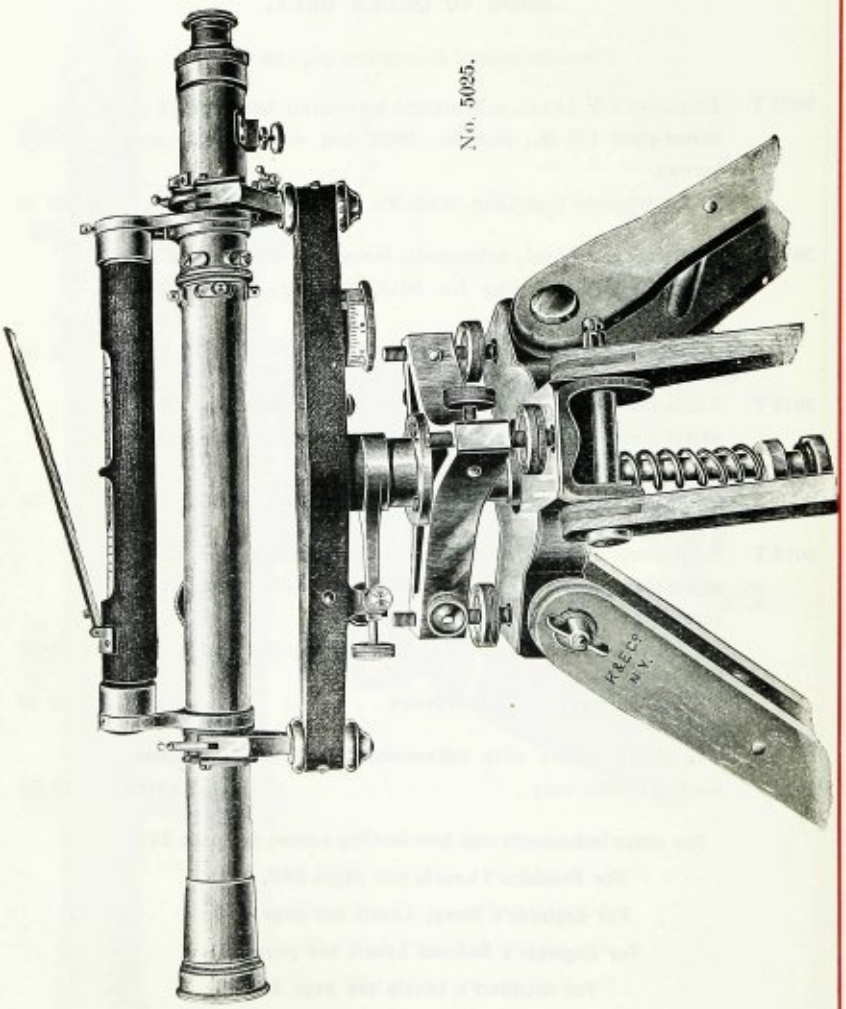
For Engineer's Dumpy Levels see page 343.

For Engineer's Railroad Levels see page 391.

For Architect's Levels see page 385.

We have the best facilities for repairing Surveying Instruments of any make.

K & E
PRECISION "Y" LEVEL



K & E
PRECISION "Y" LEVEL

5025. K & E Precision Y Level, achromatic terrestrial **telescope 18 in.**, with dust cap and sunshade, **object glass 1⅜ in** with improved rack movement, **eyepiece** with patent micrometer focusing arrangement with lock nut. Very sensitive long **striding spirit level** graduated on the glass, adjustable vertically and horizontally, with hinged **mirror** mounted in aluminum. The **bar** is of gun metal and shaped to combine greatest stiffness with least weight. Within it is another bar, rigidly attached to the centre to which it is so pivoted that it moves in a vertical plane, controlled by a **graduated micrometer screw** and a strong counter-spring. The telescope rests in **Y's**, one of which is adjustable for altitude. The Y's are provided with improved adjustable stop for so placing the telescope that the cross hairs are vertical and horizontal. The telescope is locked in the Y's by a patented arrangement dispensing with the pin bolts. The **leveling screws** are of German silver. The **clamp and improved tangent screw**, with counter-spring are of German silver; they are attached to the bar and revolve with it so that they are always equally accessible. **Three leveling screws.**

Instrument complete, with adjusting pins, waterproof cover, etc., in fine polished mahogany Box and with extra-strong Split Tripod $175 00

The above Level with **steel centre**, (made to order only) . . . extra 10 00

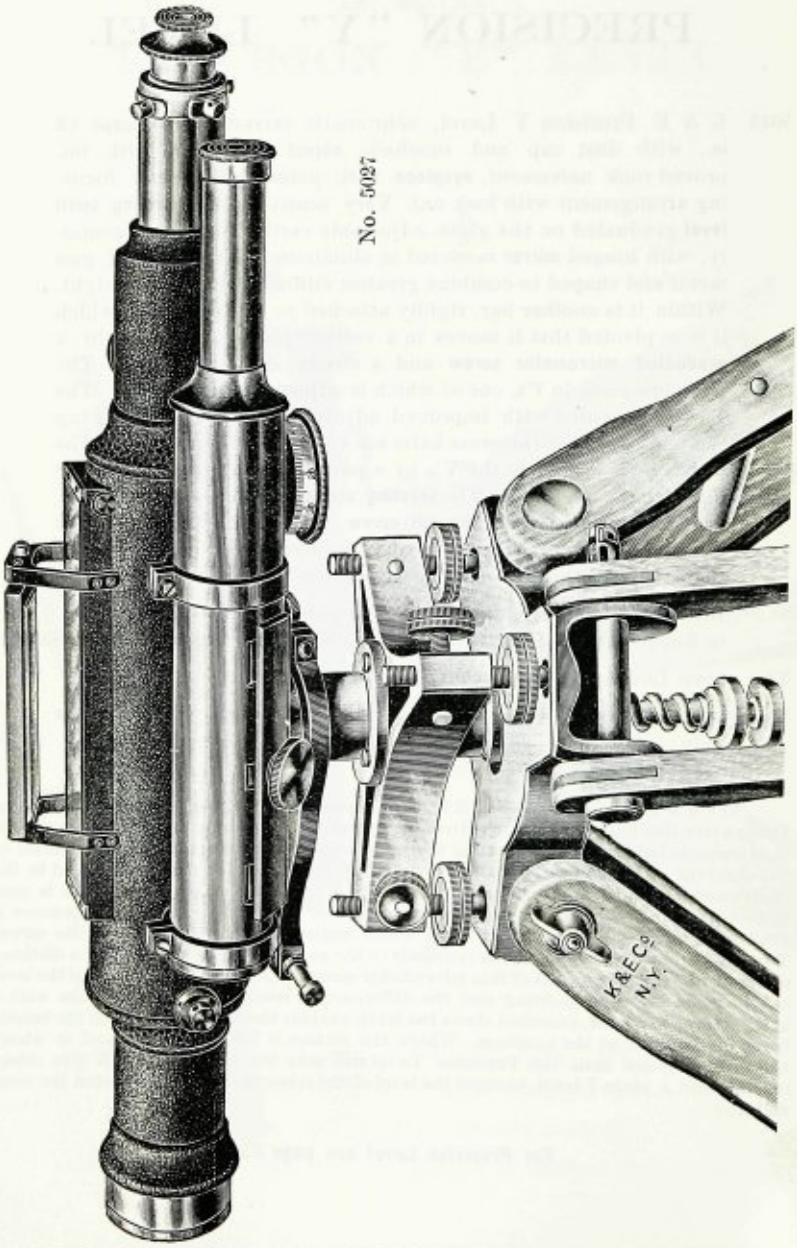
The above Level with **astronomical** (inverting) **telescope**, made to order only . . . . . extra 10 00

The K & E Precision Y Level, (3 leveling screws) is of highest grade workmanship. It has extra-fine lenses, a very sensitive spirit level and extra-long and strong centre. It is so constructed that the level of the telescope is constantly under immediate control of the observer. The bar carrying the Y's is pivoted on another bar rigidly attached to the centre and placed within it, so that it moves in a vertical plane, which motion is controlled by a micrometer screw with strong counter spring. The head of this screw is graduated and reads opposite an index which registers the revolutions of the screw. Two full revolutions will move the crosshair to the extent of 1 foot on a rod at a distance of about 100 feet. By means of this micrometer screw, delicate re-adjustment of the level can be made for each sighting and the difference in level can be read off like with a gradienter. A mirror, mounted above the level, enables the observer to watch the bubble from his position at the eyepiece. Where the station is frequently changed or where the ground is not firm, the Precision Level will save much time and will give closer results than a plain Y level, because the level of the telescope can be corrected for each sighting.

For Precision Level see page 351.

PRECISION LEVEL.

(Made after the U. S. C. & G. Survey Level.)



PRECISION LEVEL

(Made after the U. S. C. & G. Survey Level)

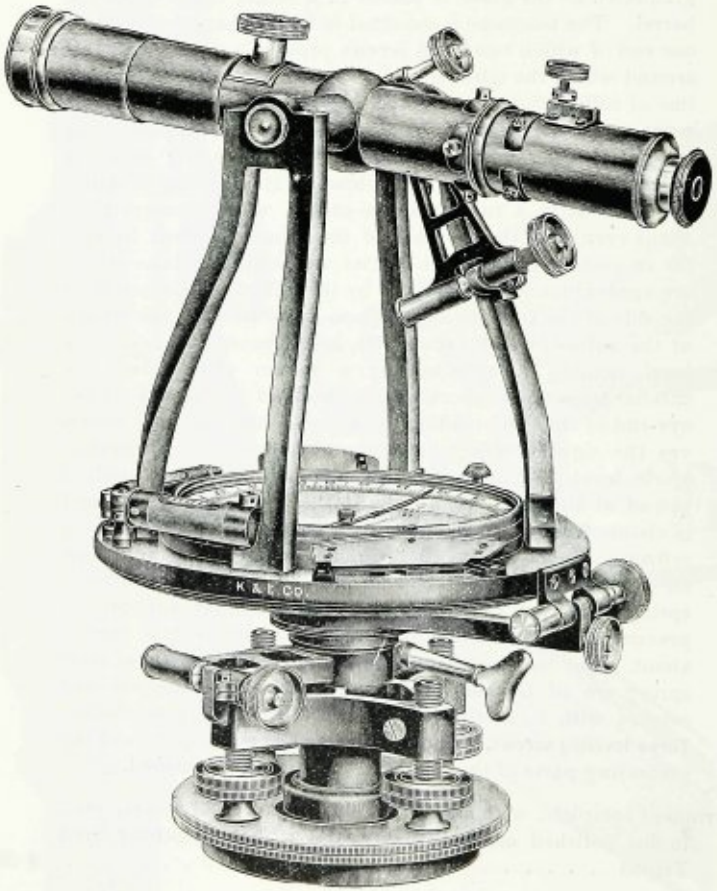
5027. Precision Level, achromatic astronomical (inverting) **telescope 16 in., object-glass 1 1/8 in.**, with improved rack movement. The extra-sensitive, long spirit level with chambered vial graduated on the glass, is placed in a recess in the telescope barrel. The telescope is mounted in a tube-shaped support, at one end of which two pivot screws provide a horizontal axis around which the telescope can be moved in altitude and the line of collimation put into the horizon by means of a **micrometer screw** at the other end of the tubular support. The head of this screw is graduated. A level-reading device is mounted at the side of the telescope at binocular distance from it. It is a tube, the eye-end of which reaches back about even with the eyepiece of the telescope when focused for an average distance; it carries two sliding prisms which are approximated or separated by the milled thumb screw at the side of the tube, to adjust them accurately to the length of the bubble, which varies with temperature changes. The level reading is reflected by a mirror placed over the tubular telescope support, and is observed by the eye at the eye-end of the level-reading device while the other eye observes the sighted object through the telescope. A circular spirit level (for approximately leveling the tripod-head) is placed at the right-hand side of the telescope support, and is visible from the eye-end of the telescope by means of a reflector attached to it. A lever handle raises the telescope off the micrometer screw and presses it gently against a spring sunk into the upper part of the tubular support, to prevent jarring the telescope while the instrument is carried about. The clamp and improved tangent screw with counter-spring are of German silver and attached to the bar and revolve with it, so that they are always equally accessible. **Three leveling screws.** The tubular telescope support, and the projecting parts of the telescope tube are cloth finished.

Instrument complete, with adjusting pins, waterproof cover, etc., in fine polished mahogany Box, and with extra-strong Split Tripod . . . . . $ 300 00

For K & E Precision Y Level see page 349.

EXTRA-FINE

ENGINEER'S TRANSIT



No. 5030.

EXTRA-FINE

ENGINEER'S TRANSITS.

PLAIN.

The transits here described, to which the general description page 329 etc. refers, are the styles which we keep in stock. When other styles are wanted we make them to order.

(For Synopsis of Transits see page 384.)

5030. Engineer's Transit (for repeating angles) with achromatic terrestrial **telescope 10¾ in**, with clamp and tangent screw of improved pattern with counter-spring, **object-glass 1 3/16 in.**, with dust cap and sun shade, improved rack-movement, **eyepiece** with patent micrometer focusing arrangement with lock nut; fixed **stadia hairs**. **Compass** ring graduated on solid silver, **variation plate**. Improved **needle** about **4½ in.**, **horizontal limb 6 in.**, graduated on solid silver to half-degrees and numbered like fig. IV, page 336; two **verniers** at about 45° with telescope, reading to one minute, with hinged reflectors lined white. Two fine graduated **spirit levels** to horizontal limb. **Four Leveling Screws**. All leveling and tangent screws of German silver, improved tangent screws with counter-spring. Extra-long anti-friction centres. **Shifting centre**.

Instrument complete, with plumb bob, magnifying glass, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box and with No. 5178 Split Tripod . . . . . $ 185 00

5032. Engineer's Transit, like No. 5030, but **telescope 11½ in.**, **object-glass 1¼ in.**, **needle** about **5 in.**, **horizontal limb 6½ in.** Instrument complete, with No. 5178 Split Tripod, etc 190 00

The above instruments with **three leveling screws**, (made to order only) . . . . . extra 15 00

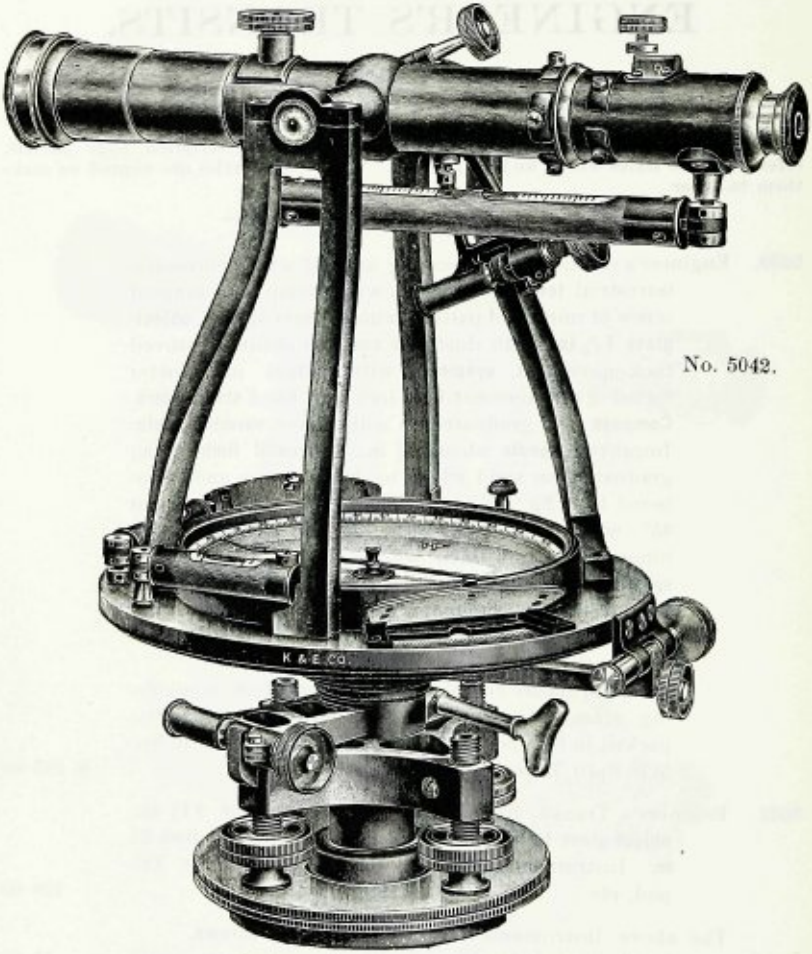
Above instruments with **astronomical** (inverting) **telescope** (No. 5030 **object glass 1 5/16 in.**, No. 5032 **object glass 1⅜ in.**) made to order only . . . . . extra 10 00

For Engineer's Railroad Transits see page 395.

For Attachments and Parts see page 398.

We have the best facilities for repairing Surveying Instruments of any make.

EXTRA-FINE
ENGINEER'S TRANSITS
WITH SPIRIT LEVEL TO TELESCOPE.



No. 5042.

(For Synopsis of Transits see page 384.)

5040. Engineer's Transit, as described under No. 5030, (page 353), **telescope 10¾ in., object glass 1 5/16 in.**, but with fine **spirit level** to telescope, graduated on the glass, **needle** about **4½ in., horizontal limb 6 in.** Instrument complete, with No. 5178 Split Tripod, etc. $ 205 00

5042. Engineer's Transit, like No. 5040, but **telescope 11½ in , object glass 1½ in., needle** about **5 in., horizontal limb 6½ in.** Instrument complete, with No. 5178 Split Tripod, etc. 210 00

Above instruments with **three leveling screws** (made to order only) . . . . . extra 15 00

Above instruments with **astronomical** (inverting) **telescope** made to order only . . . . . extra 10 00

See also description page 353.
For Attachments and Parts see page 398.

EXTRA-FINE ENGINEER'S TRANSITS

WITH VERTICAL ARC.



No. 5050.

(For Synopsis of Transits see page 384.)

5050. Engineer's Transit, as described under No. 5030, (page 353) **telescope 10¾ in., object glass 1 5/16 in.**, but with fine **spirit level to telescope,** graduated on the glass, **vertical arc 5 in.** diameter, graduated on solid silver to half-degrees, reading to one minute, **needle** about **4½ in., horizontal limb 6 in.** Instrument complete, with No. 5178 Split Tripod, etc. . . . . $ 220 00

5052. Engineer's Transit, like No. 5050, but **telescope 11½ in., object glass 1¼ in., vertical arc 5½ in.** diameter, graduated on solid silver to half-degrees, reading to one minute, **needle** about **5 in., horizontal limb 6½ in.** Instrument complete, with No. 5178 Split Tripod etc. 225 00

The above instruments with **three leveling screws,** (made to order only), extra 15 00

Above instruments with **astronomical** (inverting) **telescope,** made to order only . . . . . extra 10 00

See also description page 353.

For Attachments and Parts see page 398.

EXTRA-FINE

ENGINEER'S TRANSIT.



No 5062, with Gradienter.

(for price of Gradienter see page 399.)

EXTRA FINE

ENGINEER'S TRANSITS

WITH VERTICAL LIMB.

(For Synopsis of Transits see page 334.)

5060. Engineer's Transit, as described under No. 5030 (page 353,) **telescope 10¾ in., object glass 1 $^{5}/_{16}$ in.**, but with fine **spirit level** to telescope, graduated on the glass, **vertical limb 5 in.** diameter, graduated on solid silver to half-degrees, reading to one minute, **needle** about **4½ in., horizontal limb 6 in.** Instrument complete, with No. 5178 Split Tripod, etc. . . . . $ 235 00

5062. Engineer's Transit, like No. 5060, but **telescope 11½ in., object glass 1¼ in., vertical limb 5½ in.** diameter, **needle** about **5 in., horizontal limb 6½ in.**. Instrument complete, with No. 5178 Split Tripod 240 00

The above instruments with **three leveling screws** (made to order only) . . . . . extra 15 00

Above instruments with **astronomical** (inverting) **telescope,** (made to order only) . . . . . extra 10 00

For Engineer's Railroad Transits see page 395.

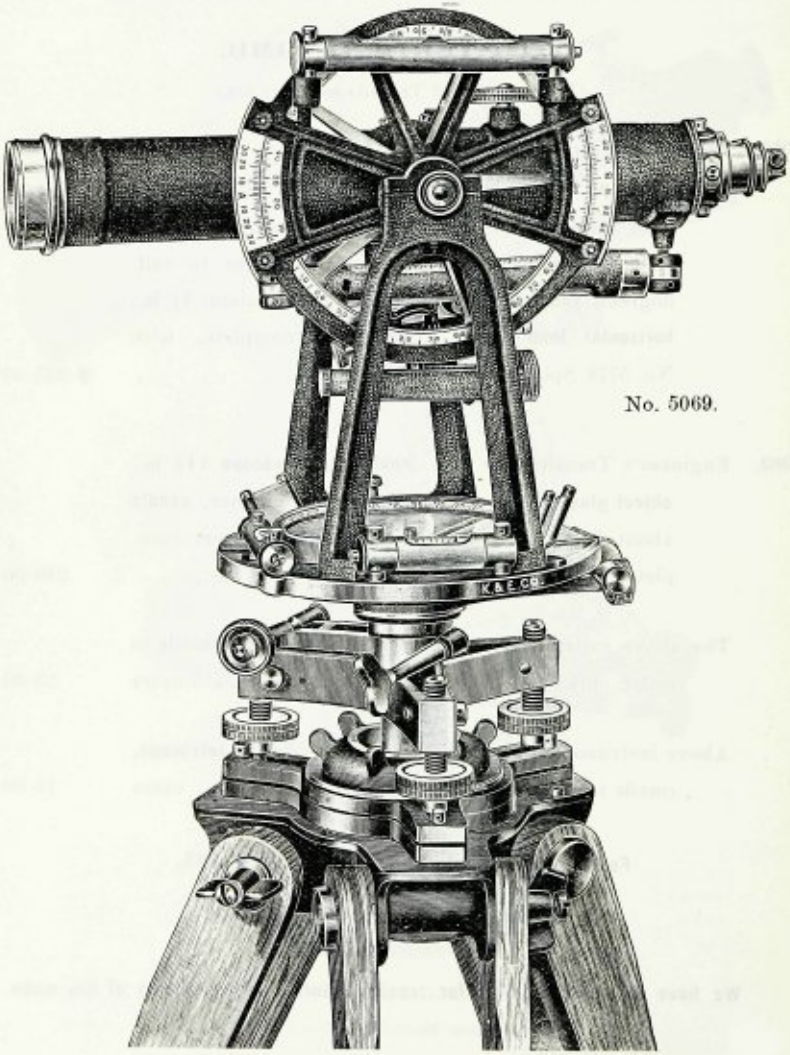
For Attachments and Parts see page 398

We have the best facilities for repairing Surveying Instruments of any make.

EXTRA-FINE

ENGINEER'S TRANSIT.

(WISCONSIN TRANSIT.)



No. 5069.

EXTRA-FINE

ENGINEER'S TRANSIT.

(WISCONSIN TRANSIT.)

(**Designed by Professor Leonard S. Smith, Madison, Wis.**)

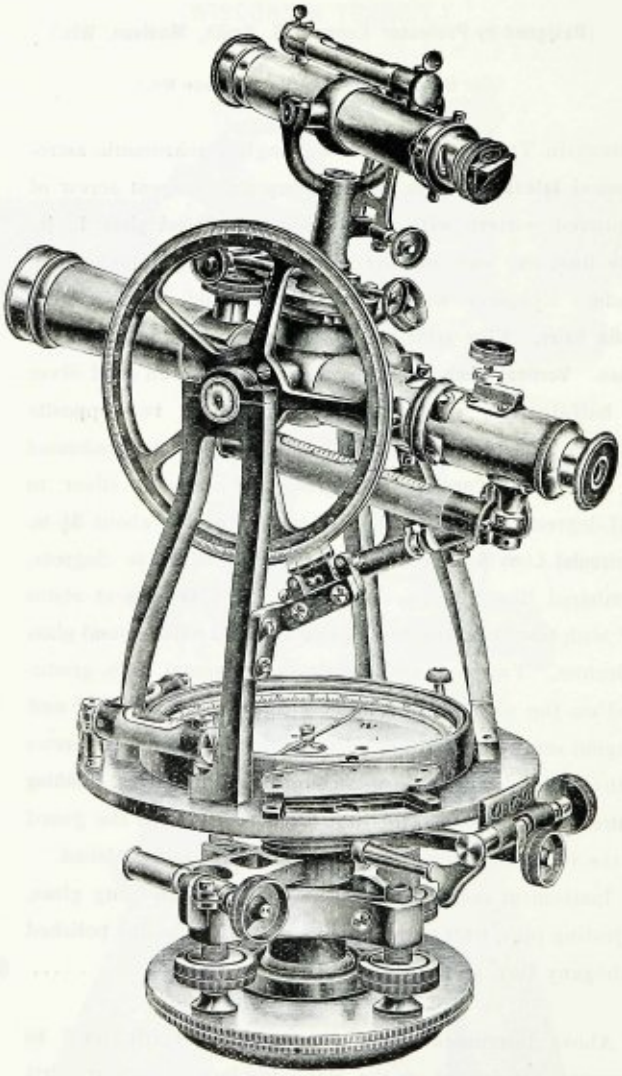
(For Synopsis of Transits see page 384.)

5069. Wisconsin Transit (for repeating angles) achromatic astronomical **telescope 11 in.**, with clamp and tangent screw of improved pattern with counter-spring. **Object glass 1⅜ in.** with dust cap and improved rack-movement, improved sun shade. Eyepiece with **prism** with colored glass. Fixed **stadia hairs.** Fine **spirit level** to telescope graduated on the glass. **Vertical Limb 5 in.** diameter graduated on solid silver to half-degrees, reading to one minute by two opposite verniers. **Guard** to vertical limb and fine **spirit level** graduated on the glass. **Compass** ring graduated on solid silver to half-degrees, **variation plate.** Improved **needle** about **3½ in.** **Horizontal Limb 5 in.** graduated on solid silver to degrees, numbered like fig. IV, page 336. Two **verniers** at about 30° with telescope reading to one minute, with ground glass reflectors. Two fine **spirit levels** to horizontal limb, graduated on the glass. **Three leveling screws.** All leveling and tangent screws of German silver, improved tangent screws with counter-spring. Extra-long anti-friction centres. **Shifting centre.** The telescope, the tube of its spirit level, the guard to the vertical limb and the standards are cloth finished.

Instrument complete, with plumb bob, magnifying glass, adjusting pins, waterproof cover etc., packed in fine polished mahogany Box, and with Split Tripod . . . . . $ 265 00

Above instrument with fine **reversible** spirit level to telescope, graduated on the glass, in place of regular spirit level . . . . . extra 15 00

EXTRA-FINE ENGINEER'S MOUNTAIN AND MINING TRANSITS.



No. 5076, with Solar Attachment No. 5090.

(For Solar Attachment see page 362).

EXTRA-FINE

ENGINEER'S MOUNTAIN AND MINING TRANSITS

(See also general description, page 329, and Synopsis of Transits page 384.)

5072. Engineer's Mountain and Mining Transit (for repeating angles) achromatic terrestrial **telescope 9 in.** with **clamp and tangent screw** of improved pattern with counter spring. **Object glass 1⅛ in.**, dust cap and sun shade with improved rack-movement, **eyepiece** with patent micrometer focusing arrangement with lock nut; **fixed stadia hairs.** Fine **spirit level to telescope,** graduated on the glass. **Compass** ring graduated on solid silver, **variation plate.** Improved **needle** about **4 in., horizontal limb 5½ in.** graduated on solid silver to half-degrees, numbered like fig. IV, page 336, two **verniers** at about 45° with telescope, reading to one minute, with hinged reflectors lined white. Two fine graduated **spirit levels** to horizontal limb. **Four Leveling Screws** All leveling and tangent screws of German silver, improved tangent screws with counter spring. Extra-long anti-friction centres. **Shifting centre.**

Instrument complete, with plumb bob, magnifying glass, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box, and with No. 5177 Split Tripod . . . . . $ 190 00

5074. Engineer's Mountain and Mining Transit, like No. 5072, but with **vertical arc 4½ in.** diameter graduated on solid silver to half-degrees, reading to 1 minute. Instrument complete, with No. 5177 Split Tripod, etc. . . 205 00

5076. Engineer's Mountain and Mining Transit, like No. 5072, but with **vertical limb 4½ in.** diameter graduated on solid silver to half-degrees, reading to 1 minute. Instrument complete, with No. 5177 Split Tripod, etc. 220 00

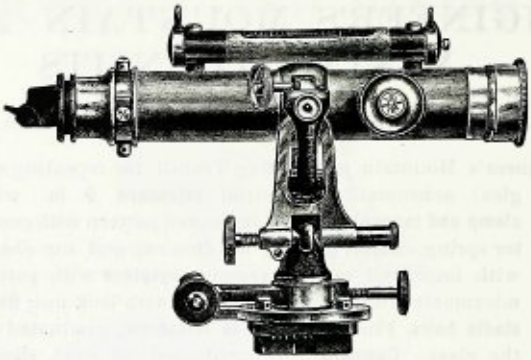
(**For Solar Attachment see next page.**)

The above instruments with **three leveling screws,** (made to order only) . . . . . extra 15 00

The above instruments, with **astronomical** (inverting) **telescope, object glass 1¼ in.**, made to order only . . extra 10 00

For Guard to Vertical Limb see page 382.
" **Engineer's Light Mountain Transit see page 365.**
" **Expedition Transit see page 369.**
" **Engineer's Locating Transit see page 397.**
" **Attachments and Parts see page 398.**

SOLAR ATTACHMENT.



No. 5090.

(See also cut of transit, page 380.)

5090. Solar Attachment, Bronze and Aluminum, achromatic astronomical (inverting) telescope 5¼ in., object glass ¾ in., with prism and colored glass, cloth-finished standard, (price includes mounting, if ordered with transit) . . . . . each $ 50 00

Transits No. 5076, 5077 and 5165 are provided with screws for attaching this Solar. See also page 383.

The astronomical meridian, the latitude and time may be obtained with this Solar Attachment with great accuracy by a simple operation explained in the following. It **serves also as vertical sighting telescope,** making a valuable addition for mine work, etc. (see page 383.)

It consists of a small telescope with prism to eyepiece, mounted in a Y-shaped standard which revolves upon a vertical axis attached on top of the telescope of the transit. This small telescope, called the solar telescope, is capable of rotation in altitude and azimuth, slow motion being imparted to it in either direction by means of tangent screws. The vertical axis, called the polar axis, can be inclined to correspond with the axis of the earth's rotation by inclining the transit telescope to which it is attached, the vertical limb giving the inclination. A spirit level which surmounts the solar telescope is provided with two pointers, so placed that when the shadow of one of them falls upon the other, the sun will be in the field of view.

DIRECTIONS FOR DETERMINING THE MERIDIAN.

1. Incline the transit telescope until the angle of declination, corrected for refraction, is indicated by the vertical limb or arc, depressing the telescope if the sun's declination is north, and elevating it if it is south. See Fig. 1.

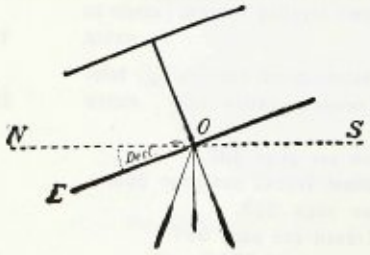


Fig. 1.

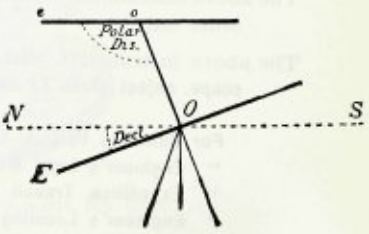


Fig. 2.

2. Bring the solar telescope into the vertical plane of the transit telescope, (without disturbing the position of the latter) and also to a horizontal position by means of its level. The two telescopes will now enclose an angle equal to the amount of the declination. See Fig. 2.

3. Without disturbing the relative positions of the two telescopes, elevate the transit telescope (and with it the solar) until the amount of the co-latitude is indicated by the vernier of the vertical limb. See Fig. 3.

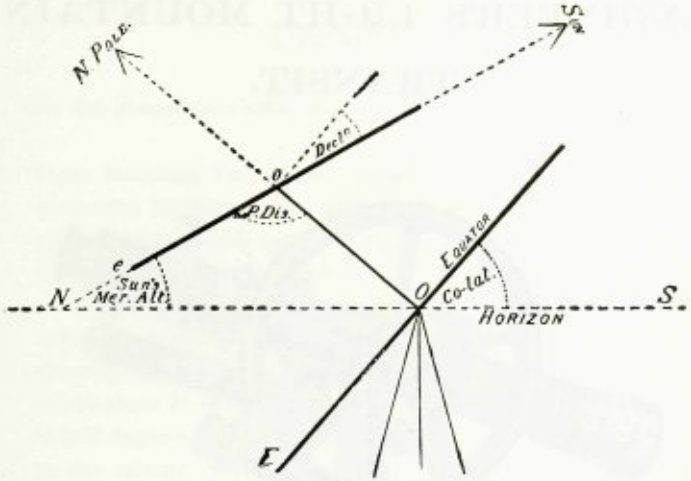


Fig. 3.

4. Revolve the two telescopes together upon their vertical axis until the image of the sun is brought into the field of the solar telescope; when the sun is accurately bisected the transit telescope will be in the meridian and the compass needle will indicate the amount of its declination at the place of observation. It will of course considerably facilitate this last operation if, before commencing to revolve the two telescopes, the transit one is approximately pointed toward the south by means of the transit compass needle.

DIRECTIONS FOR ASCERTAINING THE LATITUDE.

Direct the transit telescope towards the south, incline it to an amount equal to the sun's meridian declination uncorrected for refraction, depressing the telescope if the declination is north and elevating it if it is south. Now bring the solar telescope into the vertical plane of the transit telescope and to a perfectly horizontal position by means of its level, then clamp it. A few minutes before noon (the moment of the sun's culmination) bring the sun's image between the two horizontal wires of the solar telescope by moving *only* the *transit telescope* in altitude and azimuth. By means of the tangent screws of the transit, keep the sun, as it continues to rise and travel southwards, in this position relatively to the cross hairs of the solar telescope. When it has ceased to rise, take the reading of the vertical arc of the transit, deduct from it the refraction due to this altitude, and the remainder is the co-latitude, which deducted from 90° gives the latitude. The position of the two telescopes is identical with that shown in Fig. 3.

OBSERVATION FOR TIME.

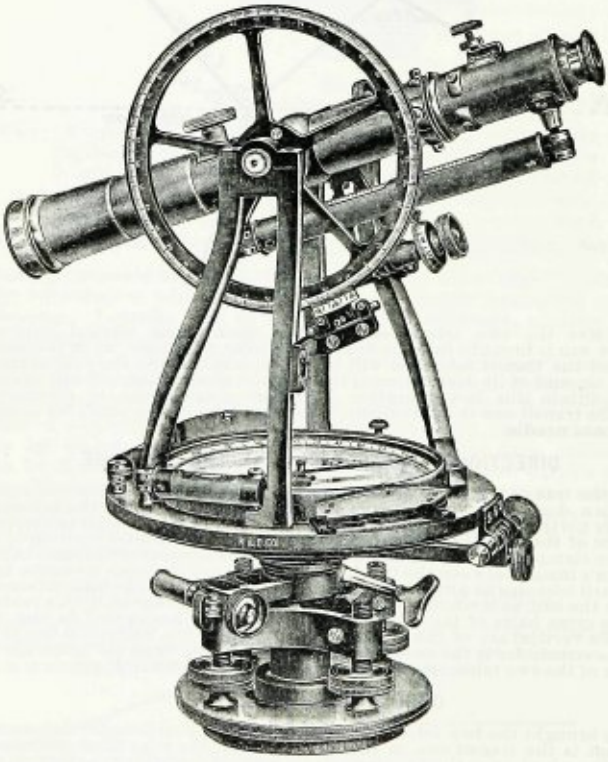
Having brought the two telescopes into their final positions for determining the meridian, that is the transit one in the meridian and the solar telescope bisecting the sun, revolve them both upon their *horizontal* axis, without disturbing the vertical axis, until they are both perfectly level. The angle formed by their respective lines of sight, which can be determined by sighting with the two telescopes upon any clearly defined distant object, and taking the difference of the respective readings of the transit horizontal limb, is the hour angle. This is then reduced to time before or after apparent noon; 1 degree of arc = 4 minutes of time and 1 minute of arc = 4 seconds of time. The time obtained by such an observation is reliable to a few seconds.

SOLAR EPHEMERIS.

We publish annually a Solar Ephemeris, vest pocket size, containing those data from the Nautical Almanac which are used in solar observations. This book we furnish free of charge to users of our instruments.

EXTRA-FINE

ENGINEER'S LIGHT MOUNTAIN TRANSIT.



No. 5077.

with Gradienter, (for price of Gradienter see page 399.)

EXTRA-FINE

ENGINEER'S LIGHT MOUNTAIN TRANSIT.

(See also general description, page 329 and Synopsis of Transits page 384.)

5077. Light Mountain Transit (for repeating angles) with achromatic terrestrial **telescope 8 in.**, with **clamp and tangent** screw of improved pattern with counter-spring. **Object glass 1⅛ in.**, dustcap and sunshade with improved rack movement, **eyepiece** with patent micrometer focusing arrangement with lock nut; fixed **stadia hairs.** Fine **spirit level to telescope**, graduated on the glass. **Compass** ring graduated on solid silver; **variation plate.** Improved **needle** about **3¼ in.**; **horizontal limb 4⅜ in.** graduated on solid silver to half degrees, two **verniers** at about 45° with telescope, reading to one minute, with hinged reflectors lined white. Two fine graduated **spirit levels** to horizontal limb. **Vertical Limb, 4 in.** diameter, graduated on solid silver to half-degrees, reading to one minute. **Four Leveling Screws.** All leveling and tangent screws of German silver, improved tangent screws with counter-spring. Extra-long anti-friction centres. **Shifting centre.**

Instrument complete, with plumb bob, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box and with Split Tripod, ... $220 00

The above instrument but with **three leveling screws** (made to order only) . . . . . extra 15 00

The above instrument with **astronomical** (inverting) **telescope**, made to order only. . . . . extra 10 00

For Guard to Vertical Limb see page 382.

" **Engineer's Mountain and Mining Transit see page 365.**

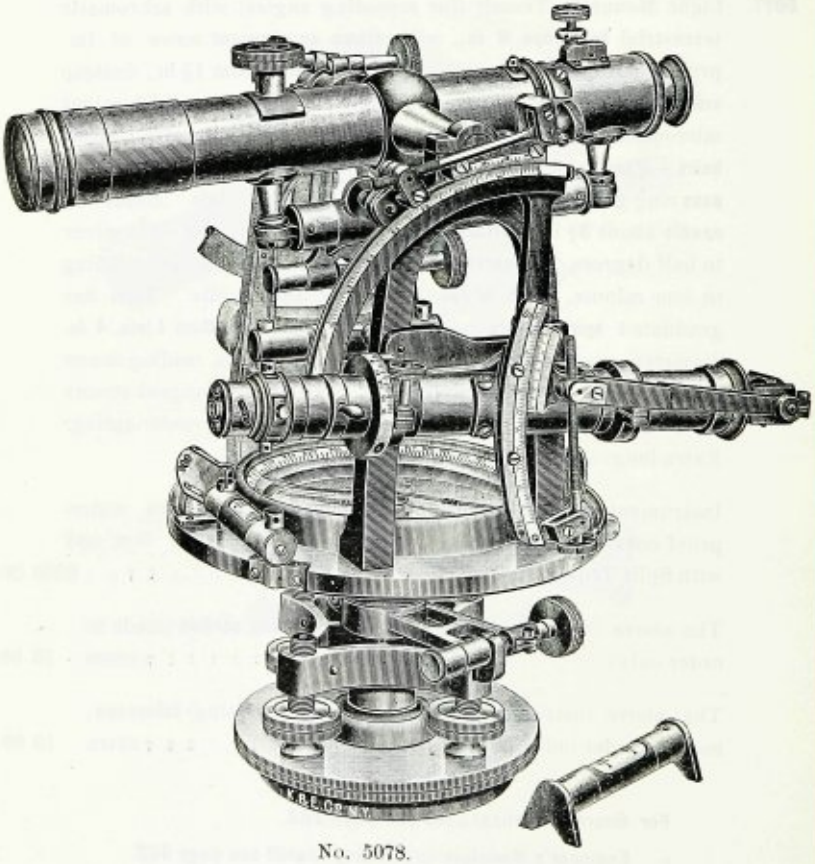
" **Expedition Transit see page 369.**

" **Engineer's Locating Transit see page 397.**

" **Attachments and Parts see page 398.**

EXTRA-FINE

ENGINEER'S SOLAR TRANSIT.



No. 5078.

EXTRA-FINE

ENGINEER'S SOLAR TRANSIT.

This instrument is used by the U. S. Land Office. It has the advantage that the solar telescope is independent of that of the transit and therefore does not require re-adjusting for each observation.

(For Synopsis of Transits see page 384.)

5078. Engineer's Solar Transit (for repeating angles) with achromatic terrestrial **telescope 9 in.**, with **clamp and tangent screw** of improved pattern with counter-spring. **Object glass 1⅛ in.**, dust cap and sun shade with improved rack-movement, **eyepiece** with patent micrometer focusing arrangement with lock nut; fixed **stadia hairs.** Fine **spirit level to telescope** graduated on the glass. **Compass** ring graduated on solid silver; **variation plate.** Improved **needle** about **4 in.**, **horizontal limb 5½ in.** graduated on solid silver to half degrees, numbered like Fig. IV, page 336, two **verniers** at about 25° with telescope, reading to one minute, with hinged reflectors lined white. Two fine graduated **spirit levels** to horizontal limb. All **leveling and tangent screws** of German silver. Improved tangent screws with counter-spring. Extra-long anti-friction centres. **Shifting centre.**

The **vertical arc** graduated on solid silver to half-degrees reading to 1 minute, is attached to the standards and the vernier arm is clamped to the axle by means of a milled-head thumb screw. **Declination arc 4 in.** radius, graduated to half-degrees, reading by vernier to 1 minute, **Solar telescope 8 in.**, with cross hairs. **Latitude arc 3 in.** radius, graduated on solid silver, reading to 1 min. **Hour circle** reading to 10 min. of time. **Striding level** for adjusting latitude arc.

Instrument complete, with plumb bob, adjusting pins, waterproof cover, etc., packed in fine polished mahogany Box and with No. 5177 Split Tripod . . $300 00

The above instrument with **astronomical** (inverting) **telescope, object glass 1¼ in.**, made to order only . . extra 10 00

See notice about pocket Solar Ephemeris, page 363.
For Solar Attachment for Transits see page 362.

EXTRA-FINE
ENGINEER'S EXPEDITION TRANSIT.



Illustration about ¾ size.

No. 5079.

Cut shows transit with prism with colored glass to eyepiece
(For price of Prism see page 399.)



Sole-leather Sling Cases for transit 5079 and for its tripod, both with shoulder strap.
(See L K on opposite page).

For sole-leather carrying cases for other transits see page 398.

EXTRA-FINE
ENGINEER'S EXPEDITION TRANSIT.

(For Synopsis of Transits see page 384.)

5079. **Expedition Transit** (for repeating angles), similar to Light Mountain Transit No. 5077 (page 365) but much smaller. Achromatic astronomical (inverting) **telescope 6¼ in.** with **clamp and tangent screw** of improved pattern, **object-glass ⅞ in.** with dust cap and sun shade, with improved rack-movement, **eyepiece** with spiral focusing arrangement, fixed **Stadia Hairs.** Fine **spirit level** to telescope, graduated on the glass. **Compass** ring graduated on on solid silver, **variation plate.** Improved **needle** about **2¾ in.**, **horizontal limb 4 in.**, graduated on solid silver to half-degrees, two **verniers** at about 45° with telescope, reading to one minute, with hinged reflectors lined white. Two fine graduated **spirit levels** to horizontal limb. **Vertical limb 3 in.** diameter, graduated on solid silver to half-degrees, hinged vernier reading to one minute. **Four Leveling Screws.** All leveling and tangent screws of German silver. Improved tangent screws with counterspring. **Shifting centre.**

Instrument complete, with plumb bob, adjusting pins, waterproof cover etc., in fine polished mahogany Box, and with Patent Extension Tripod, similar to No. 5182, page 402, but lighter . . $220 00

L. Sole-leather sling case with shoulder straps, for transit . . 8 00

K. do. skeleton sling case with shoulder strap, for tripod, 3 00

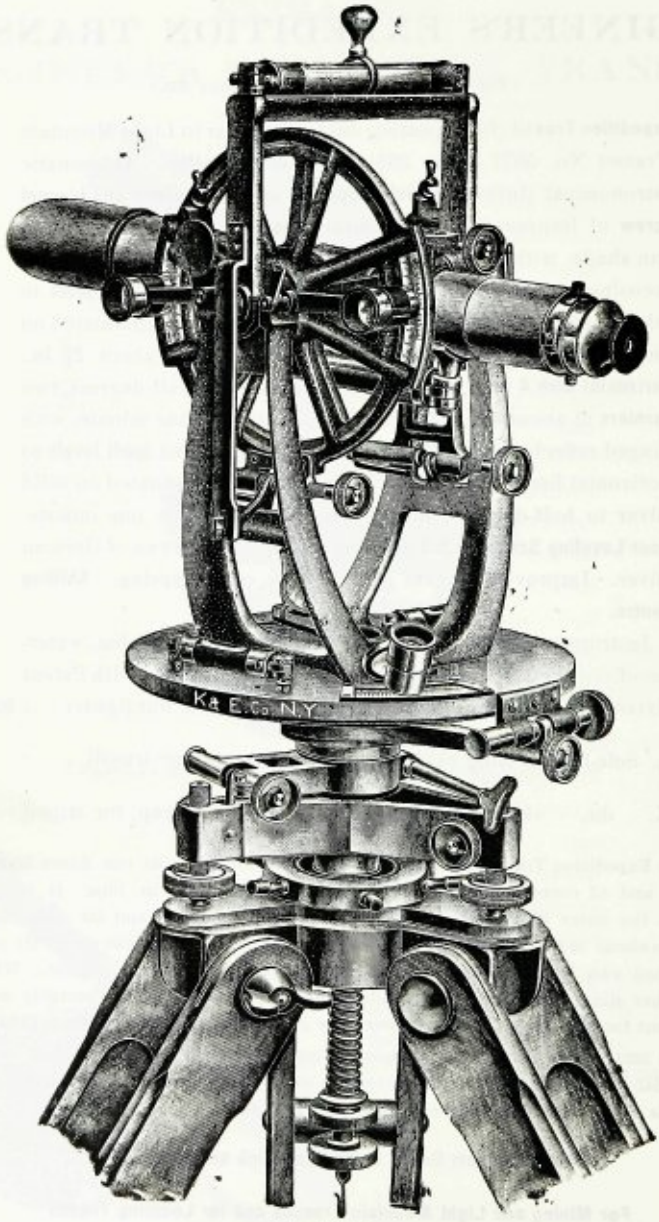
The Expedition Transit is of the same grade and quality as our finest Engineer's transits and of corresponding accuracy; the centres are 3 in. long. It is about 8 in. high, the outer diameter of the horizontal limb is 4½ in. and its mahogany box measures about 10 x 7½ x 5½ in. outside. The complete transit weighs about 4½ pounds. The tripod can be extended to 59 inches and weighs about 3½ pounds. With the sole-leather sling cases for transit and tripod this makes the most portable *accurate* instrument for the many occasions where the combination of these features is of value.

No. 5079 can be furnished, without extra charge, with telescope with erecting (terrestrial) eyepiece instead of the inverting one. This, however, necessitates higher standards as the terrestrial telescope is about 8 in. long.

For Aluminum Guard to Vertical Limb see page 382.

For Mining and Light Mountain Transits and for Locating Transit see pages 361, 365, 375, 397.

IMPROVED THEODOLITE.



No. 5080.

IMPROVED THEODOLITE.

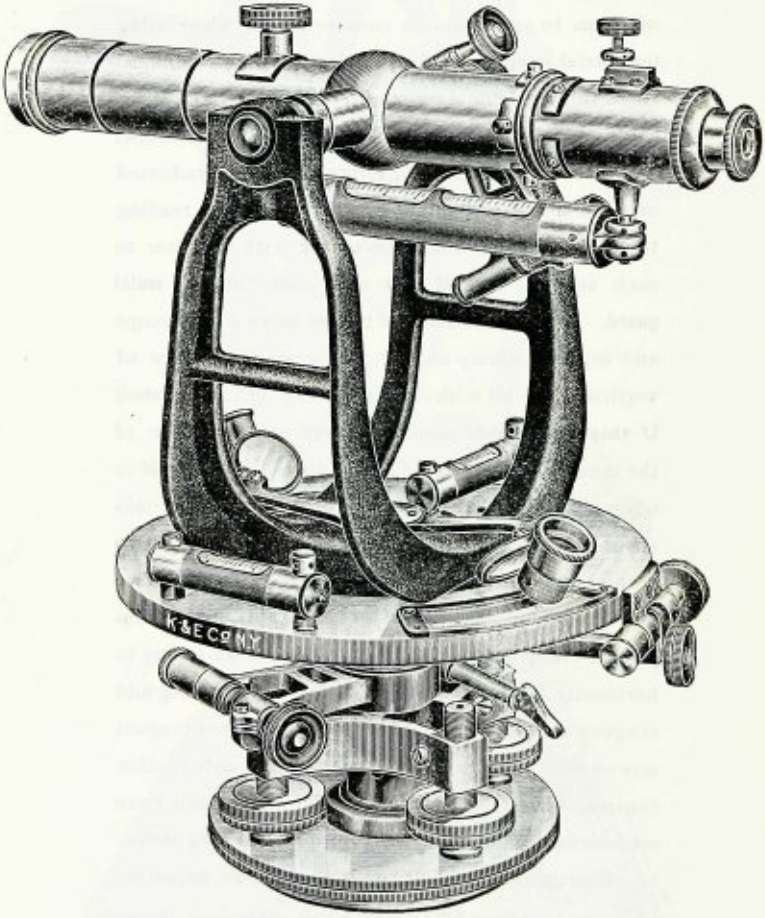
(For Synopsis of Transits see page 384.)

5080. Improved Theodolite, (for repeating angles) achromatic astronomical (inverting) **telescope 11½ in.** (14 in. when with terrestrial eyepiece), **object glass 1⅝ in.** with improved focusing arrangement and two sun shades, (one of them to serve also as counterweight when using terrestrial eyepiece). **Two eyepieces,** one astronomical (inverting) and one terrestrial (erecting). Fixed **Stadia hairs.** Fine graduated **reversible spirit level** to telescope, protected by metal mantle, **vertical limb 5½ in.** graduated on solid silver to 20 minutes, with **two verniers** reading to 20 seconds, mounted **microscope** with reflector to each vernier, **vertical limb** with cloth-finished **metal guard.** Improved **clamp and tangent screw** to telescope and separate clamp and tangent screw to verniers of vertical limb, all with counter-spring. Cloth-finished **U-shaped standards** mounted direct on the flange of the inner centre (patented). Graduated **striding level** to telescope axis. **Horizontal limb 7 in.** graduated on solid silver to 10 minutes, reading to 10 seconds by two verniers provided with mounted **microscopes.** Two fine graduated **spirit levels** to horizontal limb. Improved **Clamp and tangent screw** with counter-spring to horizontal limb and vernier plate. All leveling and tangent screws of German silver. Improved tangent screws with counter-spring. Extra-long anti-friction centres. The **three leveling arms** are slotted and have set screws to take up wear. Improved **shifting centre.**

Instrument complete, with plumb bob, adjusting pins, etc., packed in two polished mahogany Boxes and with fine Split Tripod $350 00

For Striding Compass see page 383.
For other Attachments and Parts see page 398.

K & E IMPROVED TACHYMETER.



No. 5082.

K & E IMPROVED TACHYMETER.

For Precision Work, Triangulation, etc.

(For Synopsis of Transits see page 384.)

This instrument is of improved design and has all our latest improvements. It should be used where greater accuracy is required than the usual types of transits afford.

5082. Improved Tachymeter (for repeating angles) with achromatic terrestrial **telescope 11½ in.**, with clamp and tangent screw of improved pattern with counter-spring, **object glass 1¼ in.** with dust cap and sun shade, improved rack-movement, **eye-piece** with patent micrometer focusing arrangement with lock nut, fixed **stadia hairs**, fine **spirit level** to telescope, graduated on the glass, **horizontal limb 6½ in.** graduated on solid silver to 20 minutes, and numbered like Fig. IV, page 336; two opposite **verniers** at about 30 degrees with telescope, reading to 20 seconds, two mounted **microscopes** with reflectors, for reading horizontal limb, cloth-finished **U-shaped standards** mounted direct on the flange of the inner centre (patented). Two fine graduated **spirit levels** to horizontal limb. **Four leveling screws.** All **tangent and leveling screws** of German silver, improved tangent screws with counter-spring; extra-long anti-friction centres. **Shifting centre.**

Instrument complete with plumbbob, waterproof cover, adjusting pins, etc., packed in fine polished mahogany Box and with No. 5178 Split Tripod . . . $235 00

5084. Improved Tachymeter, like No. 5082, but with **vertical arc 5½ in.** diameter, graduated on solid silver to half-degrees, vernier reading to one minute. Instrument complete, with No. 5178 Split Tripod etc. 250 00

5085. Improved Tachymeter like No. 5082, but with full **vertical limb 5½ in.** diameter, graduated on solid silver to half-degrees, vernier reading to one minute. Instrument complete, with No. 5178 Split Tripod, etc. 265 00

The above instruments **with fine Striding Level** to telescope axis, with accurately ground sensitive spirit level graduated on the glass, *made to order only* . . . . extra 20 00

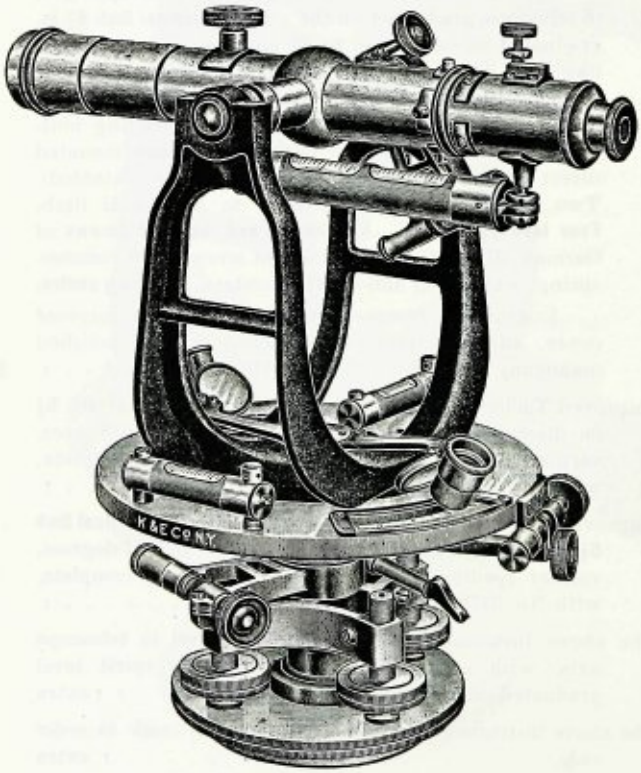
The above instruments with **3 leveling screws**, *made to order only*, ... extra 15 00

The above instruments with **astronomical** (inverting) **telescope object glass 1⅝ in.**, *made to order only* . . . . . extra 10 00

For Striding Compass see page 383.
For other Attachments and Parts see page 398.

K & E IMPROVED

MOUNTAIN AND MINING TACHYMETER.



No. 5082 M.

K & E IMPROVED
MOUNTAIN AND MINING TACHYMETER.

For Precision Work, Triangulation, etc.

(For Synopsis of Transits see page, 384.)

This instrument is of improved design and has all our latest improvements. It should be used where greater accuracy is required than the usual types of transits afford.

5082 M. Improved Tachymeter (for repeating angles) with achromatic terrestrial **telescope 8 in.**, with clamp and tangent screw of improved pattern with counter-spring, **object glass 1⅛ in.**, with dust cap and sun shade, improved rack-movement, **eye-piece** with patent micrometer focusing arrangement with locknut, fixed **stadia hairs**, fine **spirit level** to telescope, graduated on the glass, **horizontal limb 4¾ in.**, graduated on solid silver to 30 minutes, and numbered like Fig. IV. page 336; two opposite **verniers** at about 30 degrees with telescope, reading to 30 seconds, two mounted **microscopes** with reflectors for reading horizontal limb, cloth finished **U**-shaped **standards** mounted direct on the flange of the inner centre (patented). Two fine graduated **spirit levels** to horizontal limb. **Four leveling screws.** All **tangent and leveling screws** of German silver, improved tangent screws with counter-spring; extra-long anti-friction centres. **Shifting centre.**

Instrument complete with plumbbob, waterproof cover, adjusting pins, etc., packed in fine polished mahogany Box and with No. 5177 Split Tripod $235 00

5084 M Improved Tachymeter, like No. 5082 M. but with **vertical arc 4 in.** diameter, graduated on solid silver to half-degrees, vernier reading to 1 minute. Instrument complete with No. 5177 Split Tripod, etc 250 00

5085 M. Improved Tachymeter like No. 5082M. but with full **vertical limb 4 in.** diameter, graduated on solid silver to half-degrees, vernier reading to 1 minute. Instrument complete with No. 5177 Split Tripod, etc 265 00

The above instruments with **3 leveling screws**, *made to order only*, ... extra 15 00

The above instruments with **astronomical** (inverting) **telescope**, *made to order only*, ... extra 10 00

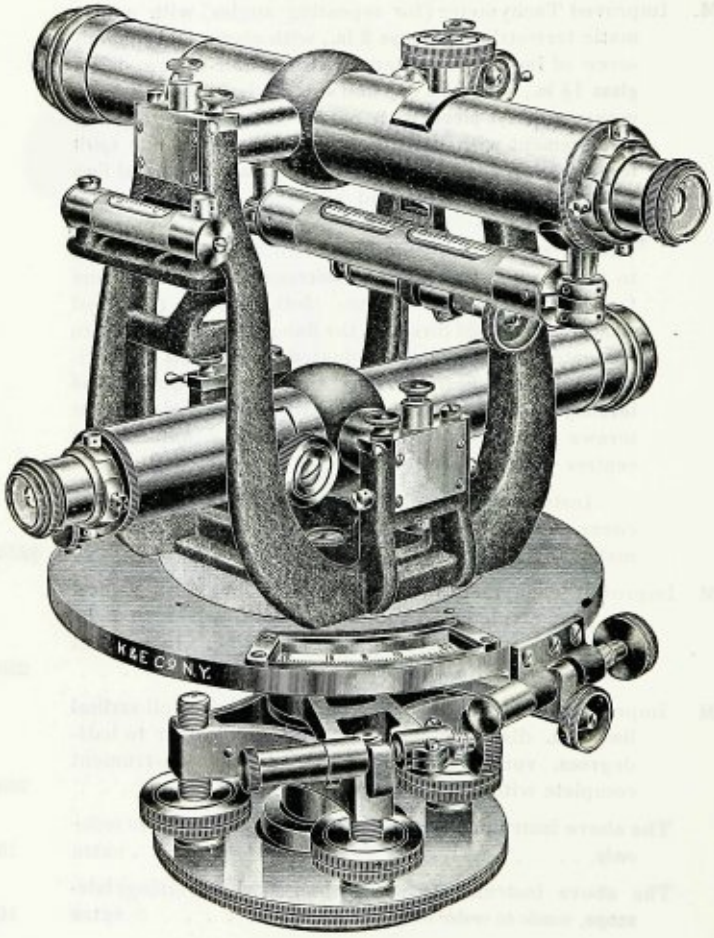
For Striding Compass see page 383.
For other Attachments and Parts see page 398.

EXTRA-FINE

ENGINEER'S CITY TRANSIT

WITH

RIGHT-ANGLE TELESCOPE.



No. 5086.

EXTRA-FINE
ENGINEER'S CITY TRANSIT
WITH
RIGHT-ANGLE TELESCOPE.

(For Synopsis of Transits see page 384.)

5086. Engineer's City Transit (for repeating angles) with achromatic astronomical (inverting) **telescope 11¼ in.**, with clamp and tangent screw of improved pattern, with counter-spring, **object glass 1 5/16 in.**, with dust cap and sun-shade, improved rack movement; fixed **stadia hairs.** Fine **spirit level** to telescope, graduated on the glass.

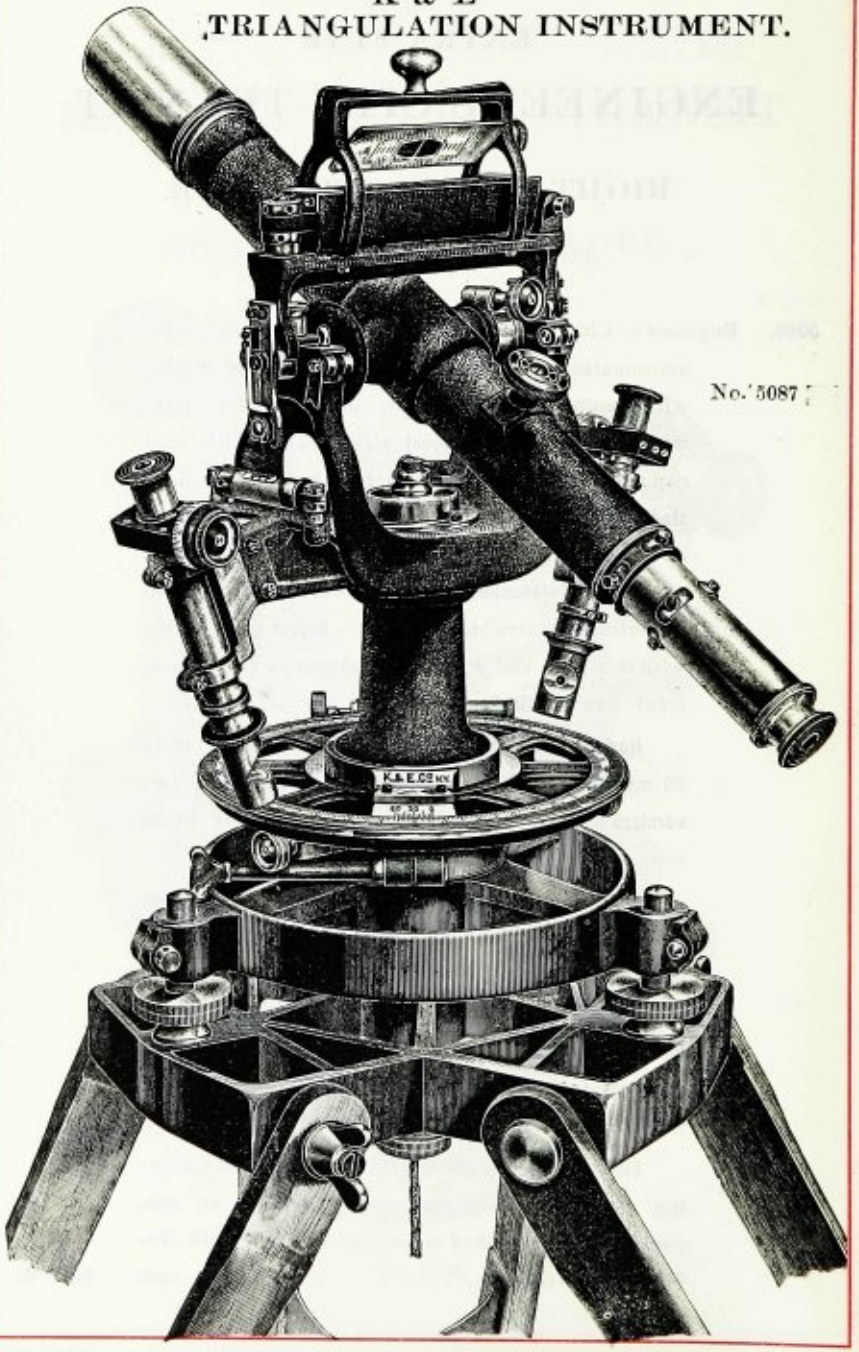
Lower Telescope 9 in. achromatic astronomical (inverting), reversible on its axis, **object glass 1¼ in.**, with dust cap and sun-shade, improved rack movement, fixed **stadia hairs.**

Horizontal limb 6½ in., graduated on solid silver to 20 minutes, numbered like fig. IV., page 336; two **verniers** at about 25° with telescope reading to 20 seconds.

Two fine **spirit levels** to horizontal limb. **Four Leveling Screws**; all leveling and tangent screws of German silver. Improved tangent screws with counter-spring. Extra-long anti-friction centres. **Shifting centre.** The cloth-covered **U-shaped standards** are very wide and firm, and are mounted direct on the flange of the inner centre (patented).

Instrument complete, with plumb-bob, magnifying glass, adjusting pins, water-proof cover, etc. packed in fine polished mahogany Box and with No. 5178 Split Tripod . . . . . each $325 00

K & E TRIANGULATION INSTRUMENT.

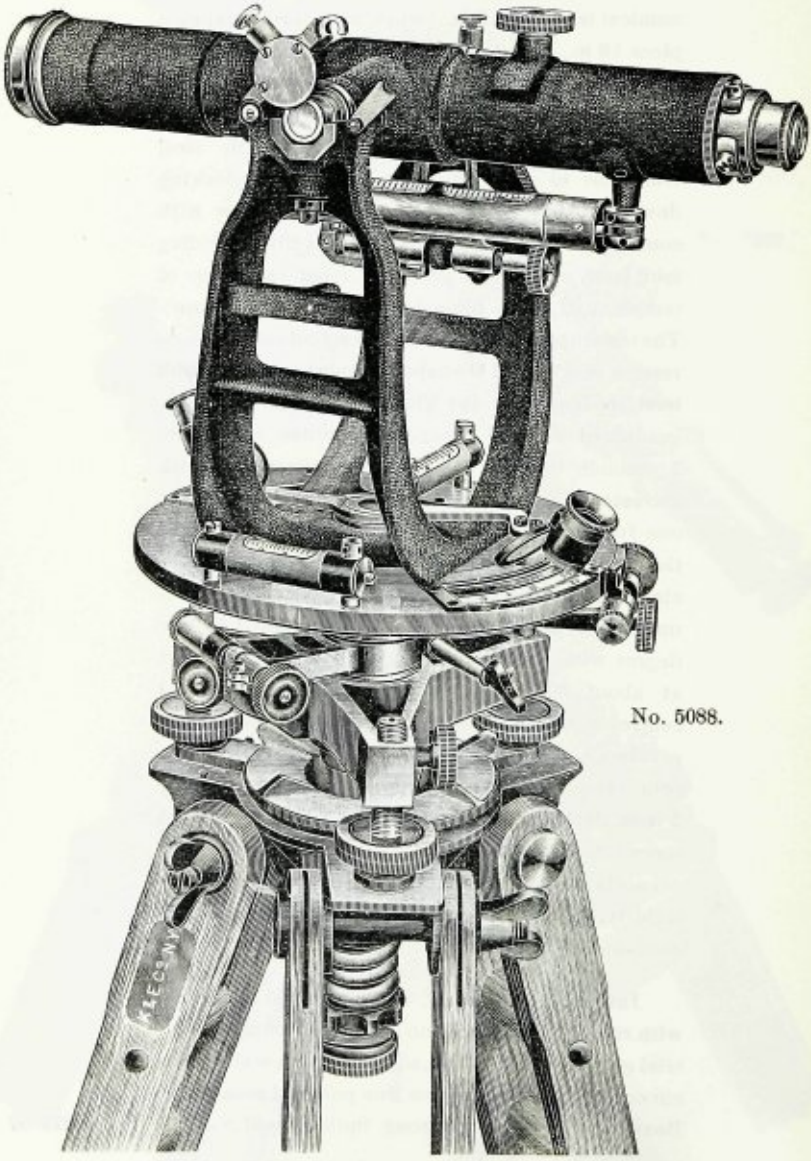


K & E TRIANGULATION INSTRUMENT

5087. Precision Theodolite for Triangulation, achromatic astronomical **telescope 13 in.** (when with terrestrial eyepiece **16 in.**,) **object glass 1⅜ in.** with improved rack movement, dust cap and sun shade, **two eyepieces,** one terrestrial (erecting) and one astronomical (inverting). Strong telescope axis with steel trunnions in wide bearings with patent locking device. **Clamp** with improved **tangent screw** with counter-spring. Graduated, very sensitive, striding **spirit level,** encased to protect it from variations of temperature, with hinged metal **reflector** (mirror). The telescope is mounted on a strong column, the axis resting in a ribbed **U**-shaped support, with fine **spirit level** graduated on the glass. **Horizontal limb 7½ in.** graduated on solid silver to 5 minutes, reading to 5 seconds by two opposite **filar micrometers** with **microscopes** rigidly mounted and so adjusted that one full turn of the screw covers one division of the horizontal limb. Within the graduated silver circle of the horizontal limb there is another graduation for approximate setting, graduated to one degree with vernier reading to 5 minutes, placed at about 30° with the telescope. The vertical centre on which the upper part of the instrument revolves is of steel. Improved **tangent screws** with counter-spring for horizontal limb and for centre, **3 large steel leveling screws** in slotted arms with set screws to take up wear. A stout metal ring connects the three leveling arms and adds to their rigidity. The upper part of the instrument is cloth-finished.

Instrument complete, with improved sun shade with reflector, weighted sun shade (to balance terrestrial eyepiece) plumb bob, adjusting pins, waterproof cover, etc., packed in two fine polished mahogany Boxes and with very strong Split Tripod $475 00

MUNICIPAL TRIANGULATION THEODOLITE.



No. 5088.

MUNICIPAL TRIANGULATION THEODOLITE.

(For Synopsis of Transits see page 384.)

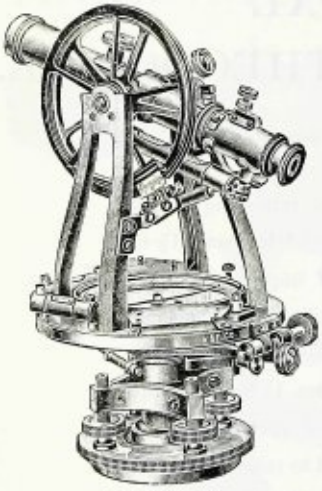
5088 Municipal Triangulation Theodolite (for repeating angles) achromatic astronomical (inverting) **telescope** 11¾ **in.** with clamp and tangent screw of improved pattern with counter-spring. The Theodolite axis has large trunions resting in wide bearings, held by our patent locking device. **Object glass** 1⅝ **in.** with dust cap and sun shade, with improved rack-movement. Fixed **stadia hairs.** Fine **spirit level** to telescope, graduated on the glass. **Horizontal limb** 6½ **in.** graduated on solid silver to 20 minutes, numbered like Fig. IV, page 336. Two opposite **verniers** at about 30° with telescope reading to 20 seconds; mounted **microscopes** with reflectors, for reading horizontal limb. Two fine **spirit levels** for horizontal limb, graduated on the glass. **Three leveling screws.** The leveling arms are slotted, and have set screws to take up wear. Shifting centre. The telescope and its axis, the tube of the spirit level and the standards are cloth-finished. All tangent and leveling screws of German silver. Improved tangent screws with counter-spring. Extra-long anti-friction centres. **Shifting centre.**

Instrument complete, with plumb bob, waterproof cover, adjusting pins, etc., etc., packed in fine polished mahogany Box and with very firm split tripod . . . . . $ 275 00

SOME ATTACHMENTS AND MODIFICATIONS

FURNISHED TO ORDER.

(See also pages 398, 399.)



No. 5167-40

Guard to Vertical Limb (aluminum) . . . . . $ 5 00



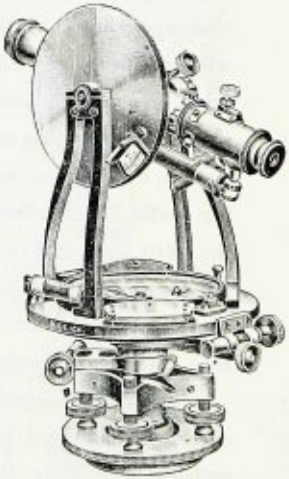
5167-41

Vertical Limb with two opposite Verniers and Guard, in place of regular Vertical Limb . . extra $20 00



No. 5167-42

Vertical Limb and Vernier graduated on the periphery, with Guard, in place of regular Vertical Limb, extra $ 15 00



5167-43

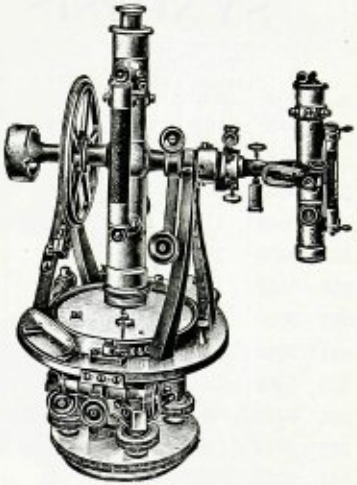
Vertical Limb, with fully encasing Metal Covering, with glass covered Vernier and ground glass reflector, in place of regular Vertical Limb, extra $ 18 00

For other Attachments and Parts see pages 398, 399, 400.



(as solar attachment)

No. 5167-44



(for vertical sighting.)

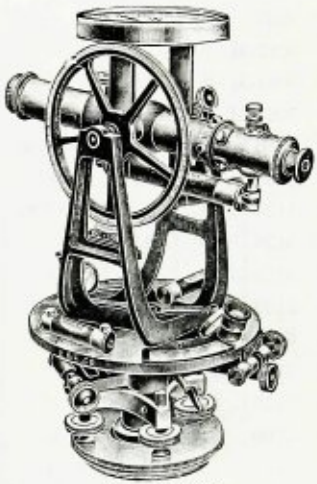
Solar Attachment No. 5090 (see page 362) interchangeable: on top of telescope for use as Solar Attachment, on end of telescope axis, with detachable counter-weight, for vertical sighting . . . . . extra $ 70 00

This attachment, made under Berger's patent, admits of quick changing of the Solar from one position to the other and has the advantage over other devices that it affords at the same time an excellent Solar and a side telescope for vertical sighting.



No. 5167-45.

Instruments with Angular Eyepiece with prism . . . . . extra $ 20 00
(These transits must be built to order, because the angular eyepiece can not be attached to a finished instrument.



No. 5167-63.

Striding Compass, 4 in. needle, graduated to half-degrees, for transits with U-shaped standards, each $15 00

For other Attachments and Parts see pages 398, 399, 400.

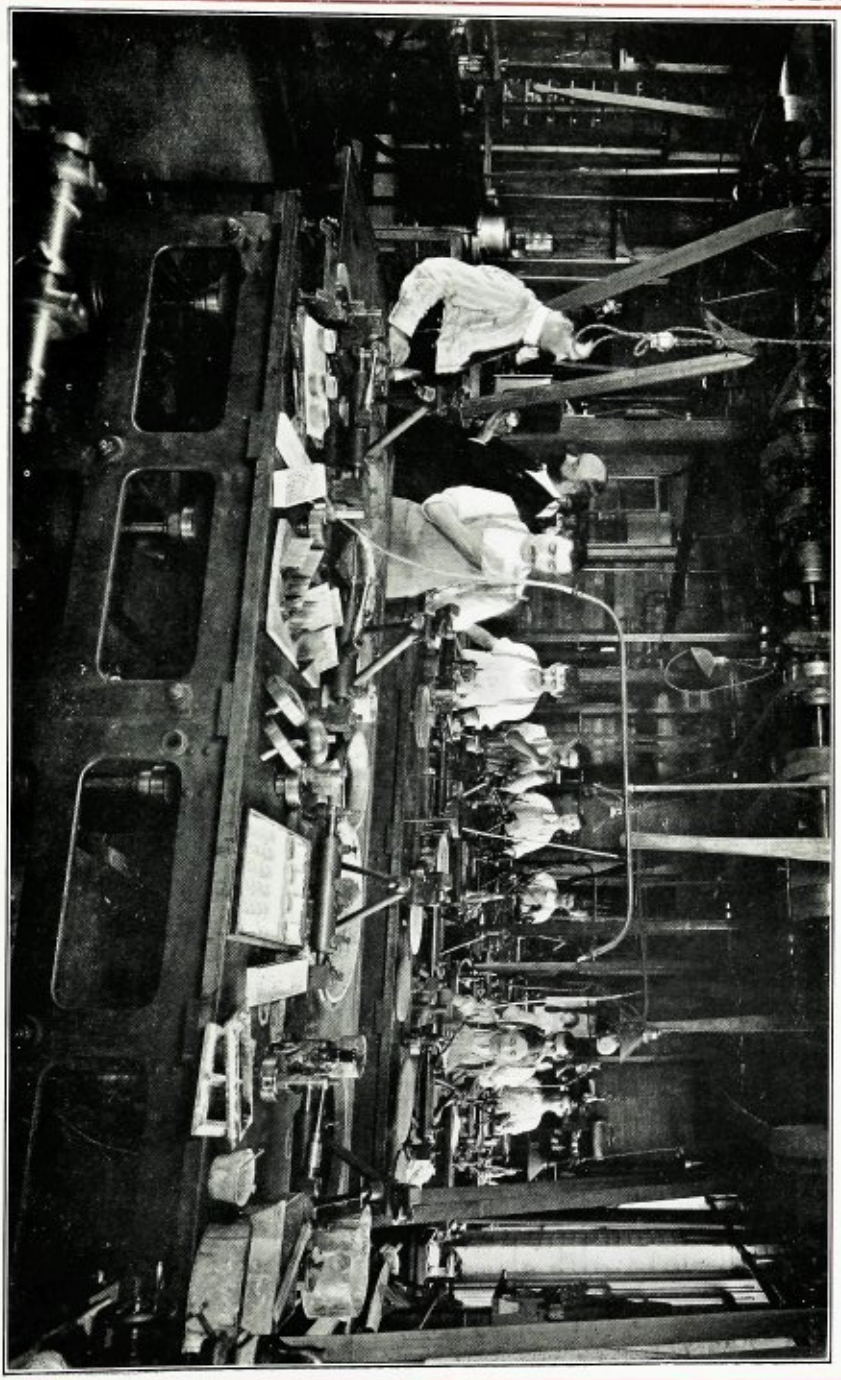
SYNOPSIS OF TRANSITS.

Page	No.	Telescope, inch.	Object glass, inch.	Eyepiece.	Comp. needle, inch.	Horiz. limb, inch.	Reading to	Vert. arc, inch.	Vert. limb, inch.	Weight about, pounds
353	5030	$10\frac{3}{4}$	$1\frac{5}{16}$	erect'g.	$4\frac{1}{2}$	6	1 min.	. .	. .	$12\frac{3}{4}$
353	5032	$11\frac{1}{4}$	$1\frac{1}{4}$	"	5	$6\frac{1}{2}$	1 "	. .	. .	$13\frac{3}{4}$
354	5040	$10\frac{3}{4}$	$1\frac{3}{16}$	"	$4\frac{1}{2}$	6	1 "	. .	. .	13
354	5042	$11\frac{1}{2}$	$1\frac{1}{4}$	"	5	$6\frac{1}{2}$	1 "	. .	. .	14
355	5050	$10\frac{3}{4}$	$1\frac{3}{16}$	"	$4\frac{1}{2}$	6	1 "	5	. .	$13\frac{1}{4}$
355	5052	$11\frac{1}{2}$	$1\frac{1}{4}$	"	5	$6\frac{1}{2}$	1 "	$5\frac{1}{2}$	. .	$14\frac{1}{4}$
357	5060	$10\frac{3}{4}$	$1\frac{3}{16}$	"	$4\frac{1}{2}$	6	1 "	. .	5	$13\frac{1}{4}$
357	5062	$11\frac{1}{2}$	$1\frac{1}{4}$	"	5	$6\frac{1}{2}$	1 "	. .	$5\frac{1}{2}$	$14\frac{1}{4}$
359	5069	11	$1\frac{3}{8}$	invert'g.	$3\frac{1}{2}$	5	1 "	. .	5	$11\frac{1}{8}$
361	5072	9	$1\frac{1}{8}$	erect'g.	4	$5\frac{1}{2}$	1 "	. .	. .	10
361	5074	9	$1\frac{1}{8}$	"	4	$5\frac{1}{2}$	1 "	$4\frac{1}{2}$	. .	$10\frac{1}{4}$
361	5076	9	$1\frac{1}{8}$	"	4	$5\frac{1}{2}$	1 "	. .	$4\frac{1}{2}$	$10\frac{1}{8}$
365	5077	8	$1\frac{1}{8}$	"	$3\frac{1}{4}$	$4\frac{3}{4}$	1 "	. .	4	8
367	5078	9	$1\frac{1}{8}$	"	4	$5\frac{1}{2}$	1 "	special	. .	13
369	5079	$6\frac{1}{4}$	$\frac{7}{8}$	invert'g.	$2\frac{3}{4}$	4	1 "	. .	3	$4\frac{1}{2}$
371	5080	$11\frac{1}{2}$*	$1\frac{3}{8}$	both	. .	7	20 sec.	. .	$5\frac{1}{2}$	$21\frac{1}{4}$
373	5082	$11\frac{1}{2}$	$1\frac{1}{4}$	erect'g.	. .	$6\frac{1}{2}$	20 "	. .	. .	15
373	5084	$11\frac{1}{2}$	$1\frac{1}{4}$	"	. .	$6\frac{1}{2}$	20 "	$5\frac{1}{2}$	. .	$15\frac{1}{4}$
373	5085	$11\frac{1}{2}$	$1\frac{1}{4}$	"	. .	$6\frac{1}{2}$	20 "	. .	$5\frac{1}{2}$	$15\frac{1}{4}$
375	5082-M	8	$1\frac{1}{8}$	"	. .	$4\frac{3}{4}$	30 "	. .	. .	$9\frac{1}{4}$
375	5084-M	8	$1\frac{1}{8}$	"	. .	$4\frac{3}{4}$	30 "	4	. .	$9\frac{1}{2}$
375	5085-M	8	$1\frac{1}{8}$	"	. .	$4\frac{3}{4}$	30 "	. .	4	$9\frac{3}{4}$
377	5086	$11\frac{1}{4}$	$1\frac{5}{16}$	invert'g.	. .	$6\frac{1}{2}$	20 "	. .	. .	$17\frac{1}{2}$
381	5088	$11\frac{3}{4}$	$1\frac{3}{8}$	"	. .	$6\frac{1}{2}$	20 "	. .	. .	16
392	5124	8	1	erect'g.	. .	5	1 min.	. .	. .	7
392	5126	8	1	"	. .	5	1 "	. .	$3\frac{1}{2}$	$7\frac{1}{4}$
393	5127	8	1	"	3	5	1 "	. .	. .	$7\frac{1}{2}$
393	5129	8	1	"	3	5	1 "	. .	$3\frac{1}{2}$	$7\frac{3}{4}$
395	5130	$11\frac{1}{2}$	$1\frac{1}{8}$	"	5	$6\frac{1}{2}$	1 "	. .	. .	$13\frac{3}{4}$
395	5140	$11\frac{1}{2}$	$1\frac{1}{8}$	"	5	$6\frac{1}{2}$	1 "	. .	. .	14
395	5150	$11\frac{1}{2}$	$1\frac{1}{8}$	"	5	$6\frac{1}{2}$	1 "	5	. .	$14\frac{1}{4}$
395	5160	$11\frac{1}{2}$	$1\frac{1}{8}$	"	5	$6\frac{1}{2}$	1 "	. .	5	$14\frac{1}{4}$
397	5165	9	1	"	$3\frac{3}{4}$	$5\frac{1}{2}$	1 "	. .	4	$10\frac{1}{4}$

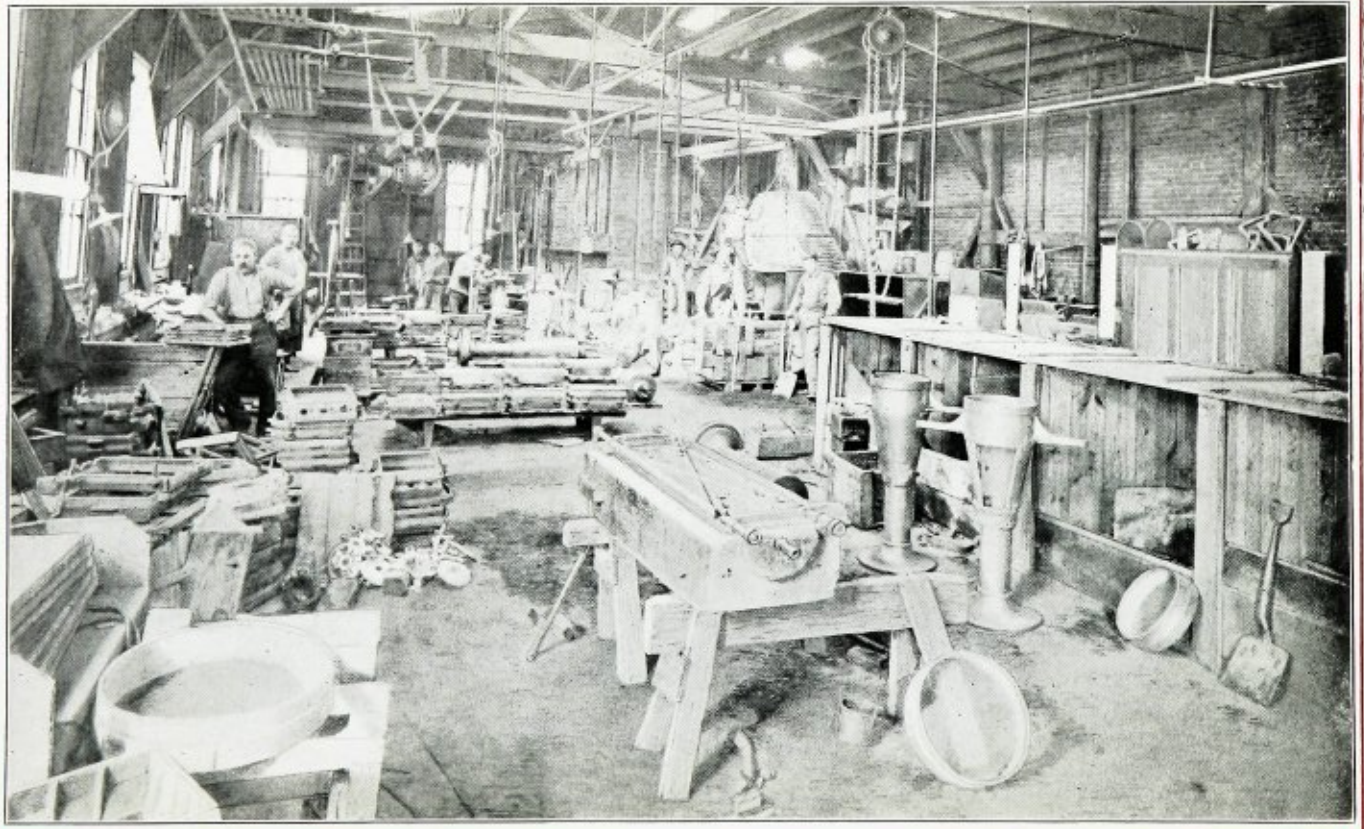
*Telescope of No. 5080 with erecting eyepiece is 14 in.

All the above transits have spirit level to telescope, except Nos. 5030, 5032 and 5130, and all have 4 leveling screws, except Nos. 5069, 5080, 5088, which have 3.

The Triangulation Theodolite No. 5087 (page 379) is omitted in this Synopsis.

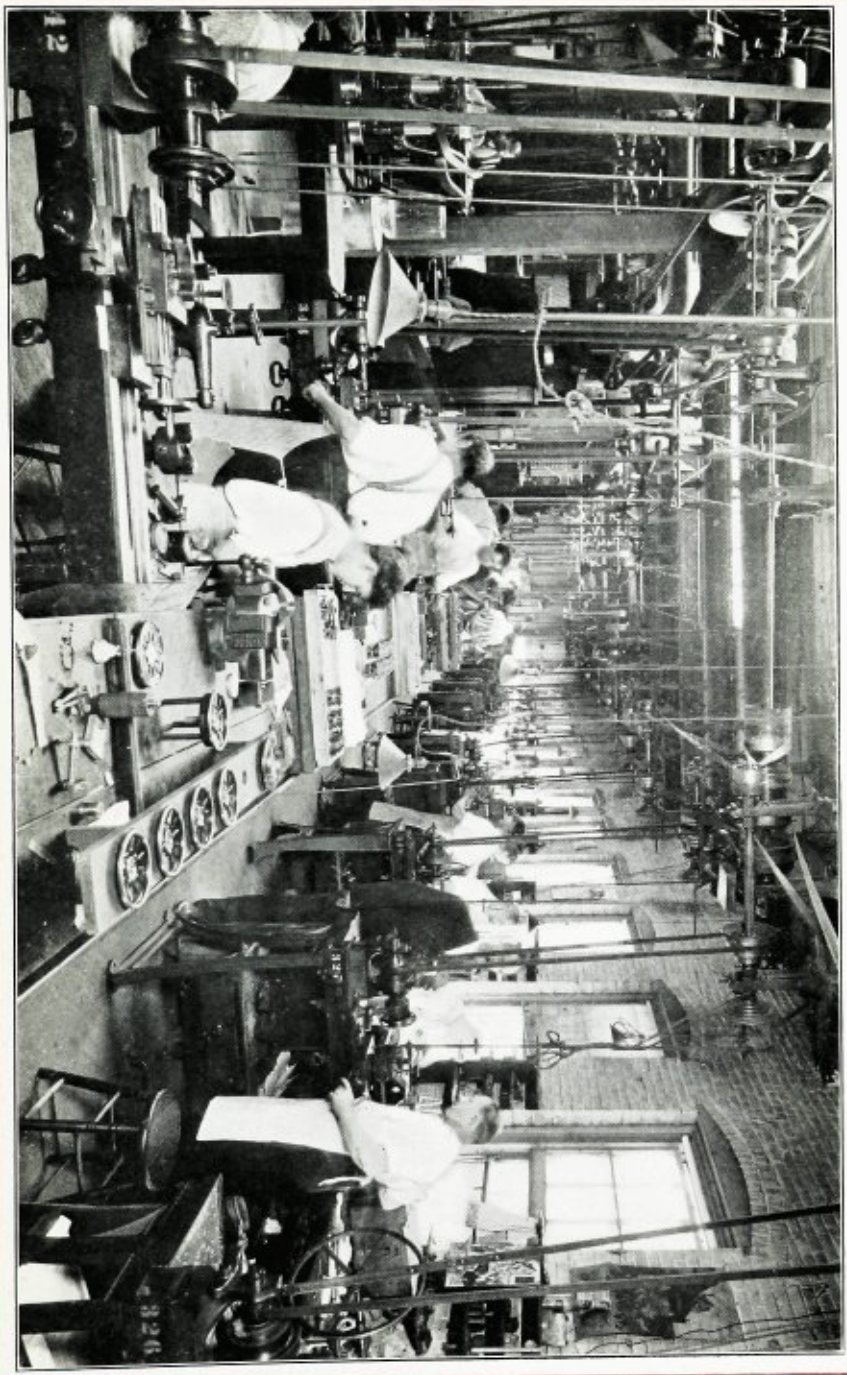


OPTICAL DEPARTMENT.—FACTORIES, HOBOKEN, N. J.

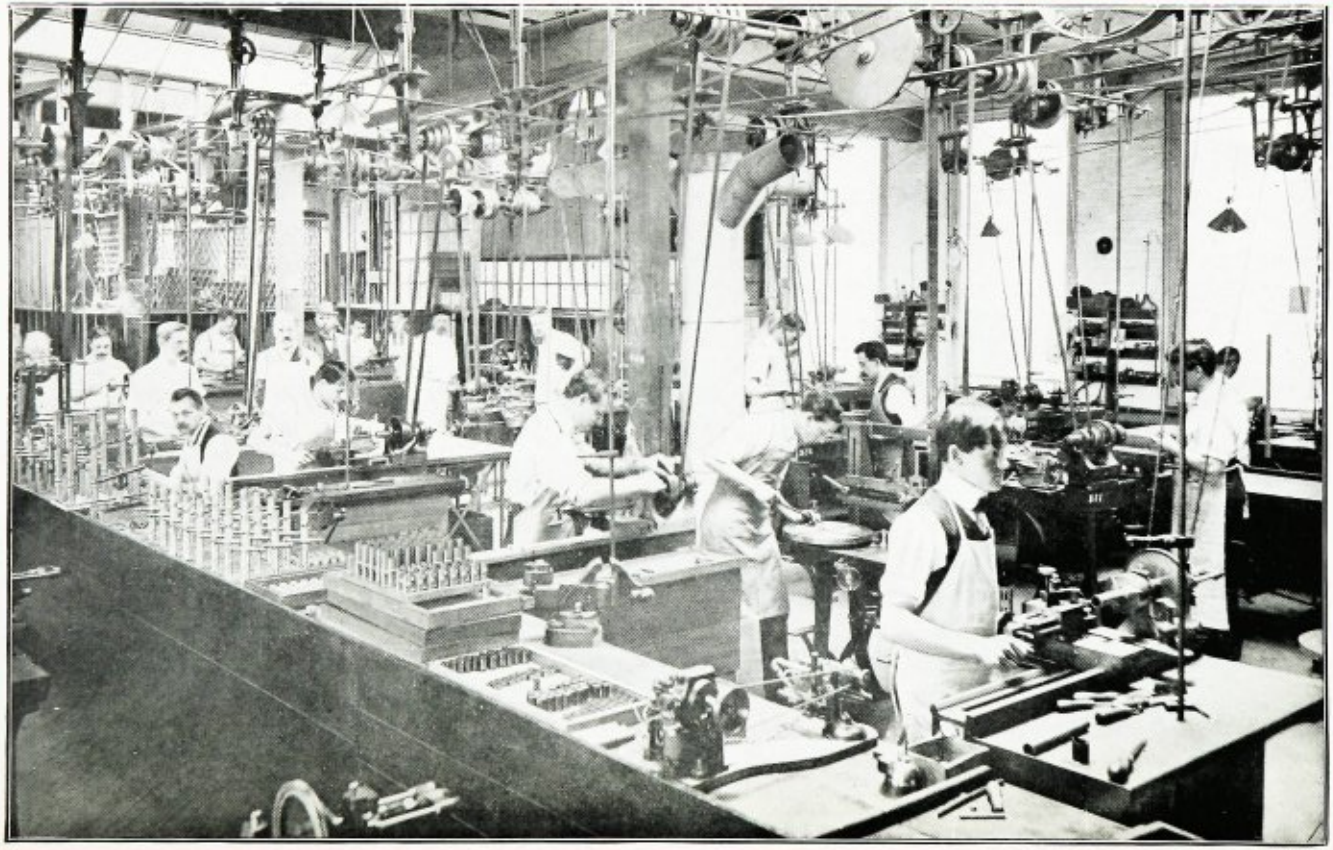


KEUFFEL & ESSER CO. NEW YORK.

THE FOUNDRY.—FACTORIES, HOBOKEN, N. J.



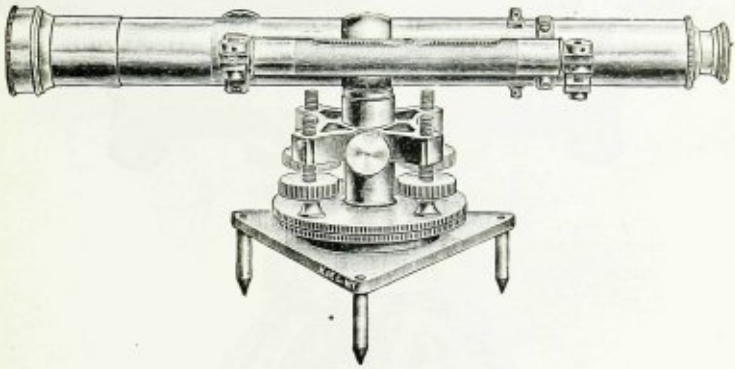
SURVEYING INSTRUMENTS.—FACTORIES, HOBOKEN, N. J.



KEUFFEL & ESSER CO. NEW YORK.

SURVEYING INSTRUMENTS.—FACTORIES, HOBOKEN, N. J.

ARCHITECT'S DUMPY LEVEL.



No. 5107.

5107. Architect's Dumpy Level. An excellent instrument for work which does not require great accuracy, such as ditching, draining, road-leveling, etc.

Achromatic terrestial telescope, **11 in., object-glass 1⅛ in.** with rack-movement, **spirit level** graduated on the glass. The eyepiece is adjustable, to focus the cross-hairs.

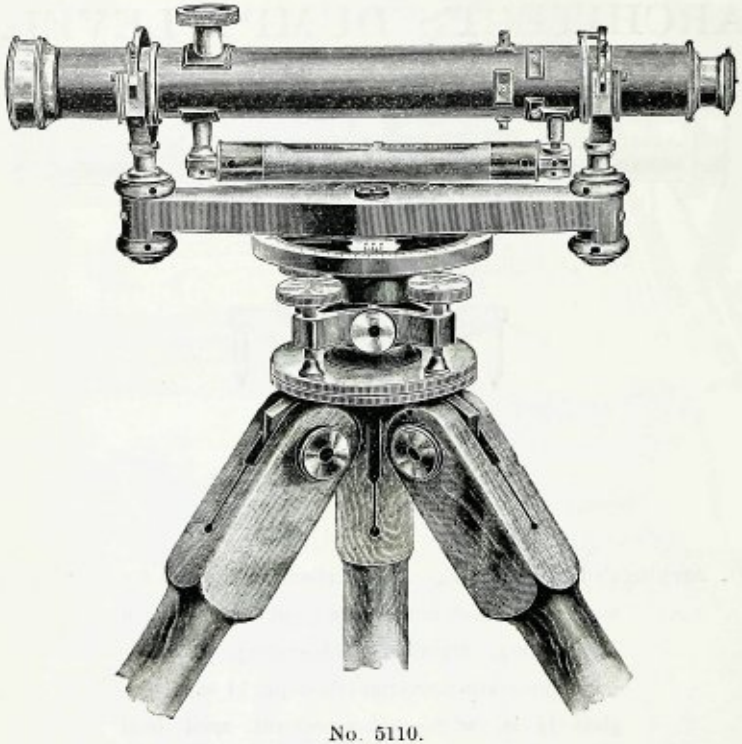
Instrument complete, with metal trivet, plumb bob, etc., in strong Box and with No. 5176 hard-wood Tripod . . . . . $ 35 00

For Extra-fine Engineer's Dumpy Levels see page 343.

For Architect's Leveling Rods see page 463.

We have the best facilities for repairing Surveying Instruments of any make promptly and satisfactorily.

ARCHITECT'S Y LEVEL.



No. 5110.

5110. Architect's or Builder's Y Level, achromatic terrestrial **telescope 11 in.** with dust shade and cross-hairs, spirit level graduated on the glass, **object-glass 1⅛ in.** with rack-movement, eyepiece adjustable to focus the cross-hairs. The **Y's** have our patent locking arrangement dispensing with the pin bolts. **Horizontal circle 3 in.** graduated to degrees, with **vernier** reading to 5 minutes. A most serviceable and compact instrument.

Level complete, with metal trivet, plumb bob and adjusting pins, in polished mahogany Box and with No. 5176 hardwood Tripod . . . . . $ 45 00

5111. Architect's or Builder's Y Level, like No. 5110, but with improved **Tangent Screw** with counter-spring . . . 50 00

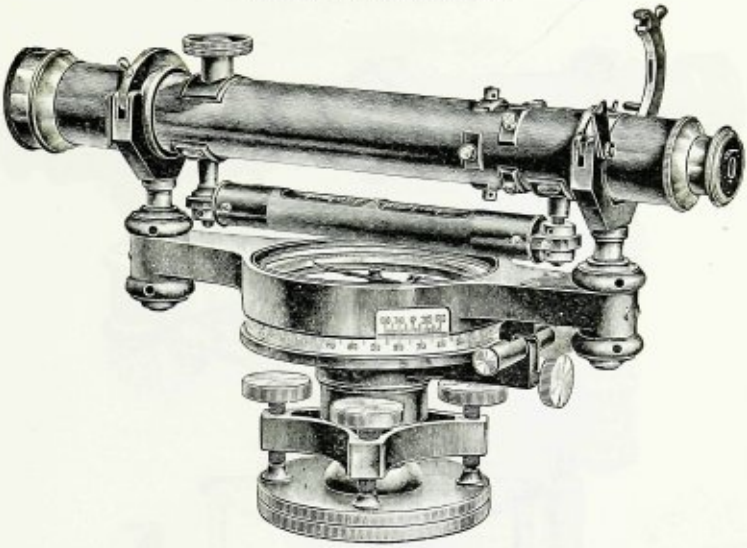
For Architect's Convertible Levels see pages 388, 389.

For Builder's Transits see page 392.

For Architect's Leveling Rods see page 463.

ARCHITECT'S Y LEVEL

WITH COMPASS.



No. 5113.

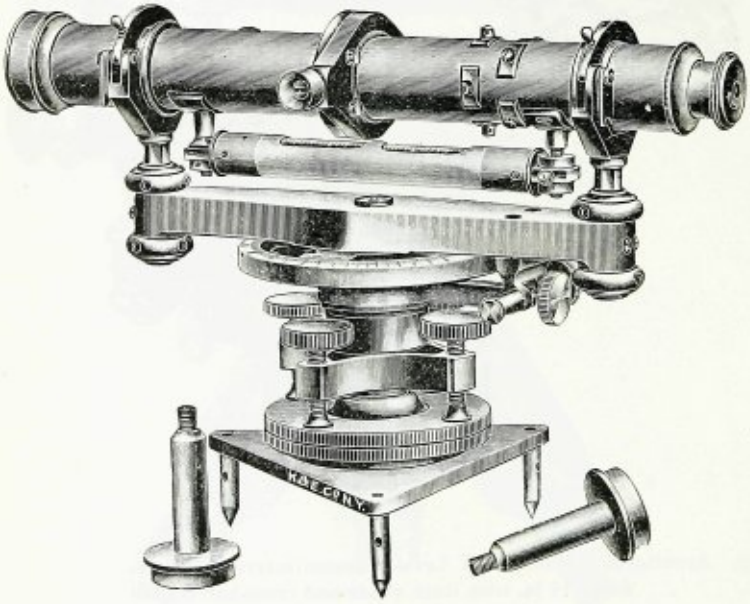
5112. Architect's or Builder's Y Level, achromatic terrestrial **telescope 11 in.** with dust shade and cross-hairs, **spirit level** graduated on the glass, **object-glass 1½ in.** with rack-movement, eyepiece adjustable to focus the cross hairs. The Y's have our patent locking arrangement, dispensing with the pin bolts. **Compass** divided on raised ring to degrees, improved **needle** about **3 in. horizontal circle 3¾ in.** divided to degrees with **vernier** reading to 5 minutes. A most serviceable and compact instrument.

Level complete, with metal trivet, plumb bob and adjusting pins, in polished mahogany Box and with No. 5176 hardwood Tripod . . . . . $ 60 00

5113. Architect's or Builder's Y Level with Compass, like No. 5112, but with improved **Tangent Screw** with counter-spring (see cut) 65 00

For Architect's Convertible Levels see pages 388, 389.
For Builder's Transits see page 392.
For Architect's Leveling Rods see page 463.

ARCHITECT'S CONVERTIBLE Y LEVEL.



No. 5115. (Sighting a horizontal line; telescope in Y's, trunnions detached.)

(See also cut on opposite page.)

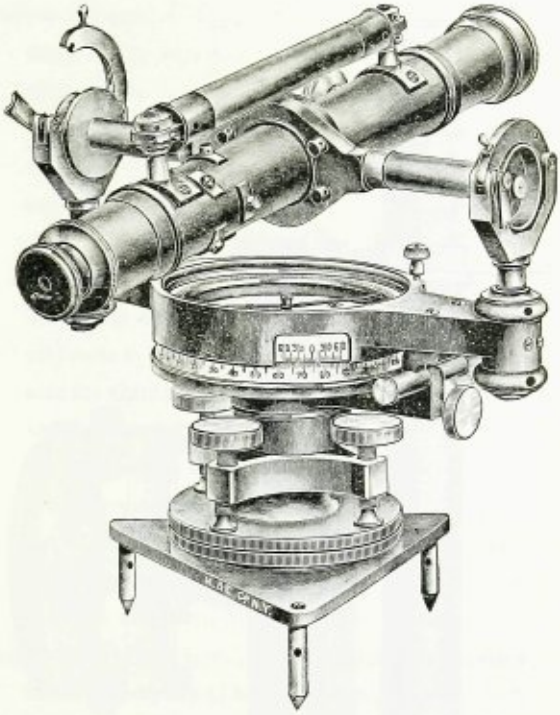
5114. Convertible Architect's Level, like No. 5110, but with **extra removable axis** to adapt telescope to sighting vertical lines, as described on page 341. Instrument complete, with metal trivet, plumb bob, etc., in polished mahogany Box, and with No. 5176 hardwood Tripod . . . . . $ 55 00

5115. Convertible Architect's Level, like No. 5114, but with improved **Tangent Screw** with counter-spring (see cut) 60 00

For Builder's Transits see page 392.
For Architect's Leveling Rods see page 463.

ARCHITECTS' CONVERTIBLE Y LEVEL

WITH COMPASS.



No. 5117. (Sighting a Vertical Line; trunnions in Y's.)
(See also cut on opposite page.)

5116. Convertible Architect's Level with **Compass,** like No. 5112, page 387, but with **extra removable axis,** as described on page 341. Instrument complete, with metal trivet, plumb bob, etc., in polished mahogany Box and with No. 5176 hardwood Tripod. $70 00

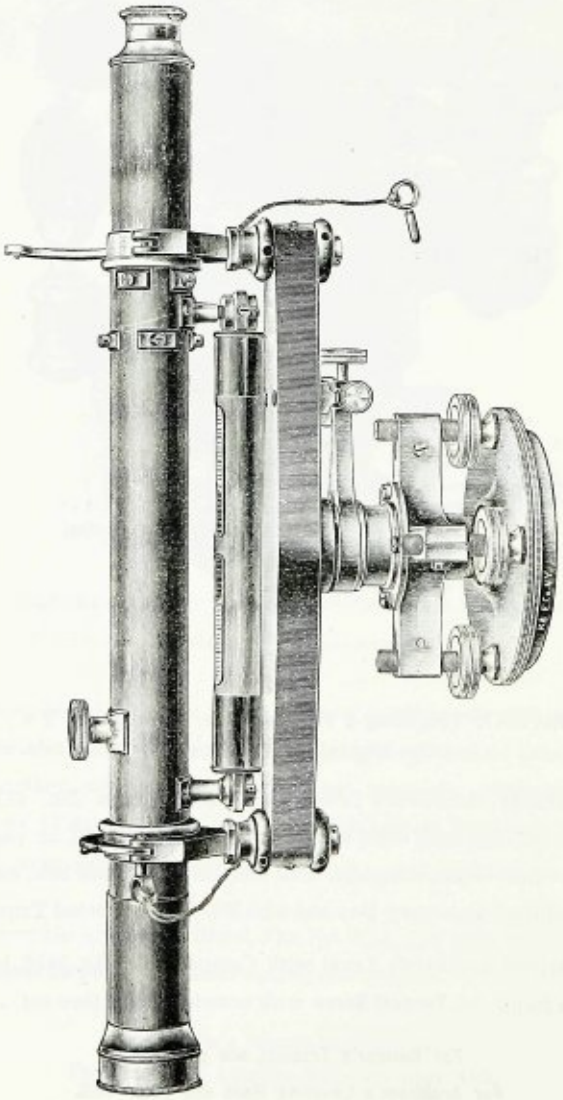
5117. Convertible Architect's Level with Compass, like No. 5116, but with improved **Tangent Screw** with counter-spring (see cut) . . 75 00

For Builder's Transits see page 392.

For Architect's Leveling Rods see page 463.

ENGINEER'S

RAILROAD Y LEVEL.



No. 5120.

ENGINEER'S

RAILROAD Y LEVELS.

5118. Engineer's Railroad Y Level, achromatic terrestrial **telescope 15 in.** with dust cap and sun shade, **object-glass 1¼ in.**, improved rack-movement, **eyepiece** adjustable for focusing cross-hairs. Graduated **spirit level** to telescope with vertical and horizontal adjustment. The **bar** is made of gunmetal and shaped to combine strength with lightness. The telescope is provided with **stop** to insure true horizontal and vertical position of the cross-hairs and rests in two strong **Y's**, one of which is adjustable for altitude. **Four leveling screws.** The clamp and improved Tangent screw with counter-spring are attached to the bar and revolve with it, to be always equally accessible.

Instrument complete, with adjusting pins, waterproof cover, etc., packed in polished mahogany Box and with No. 5177 Split Tripod . . . . $ 90 00

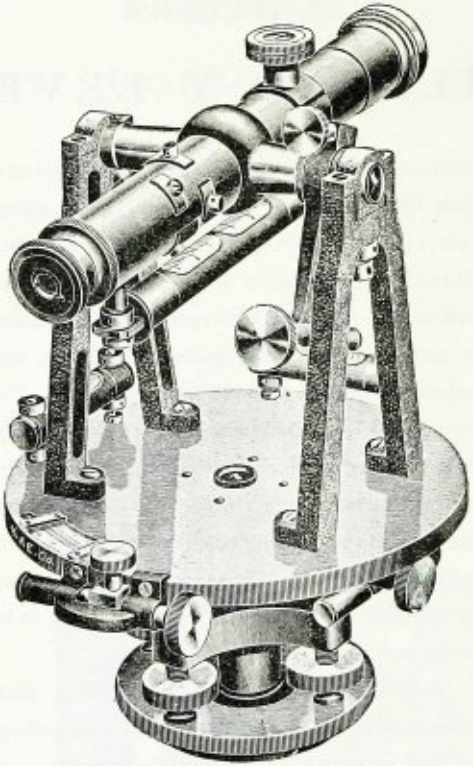
5120. Engineer's Railroad Y Level, like No. 5118, but **telescope 18 in., object glass 1⅝ in.** Complete, with No. 5178 Split Tripod, etc. 100 00

5122. Engineer's Railroad Y Level, like No. 5120, but **telescope 20 in.** Complete, with No. 5178 Split Tripod, etc. 110 00

5123. Engineer's Railroad Y Level, like No. 5120, but **telescope 22 in.** Complete, with No. 5178 Split Tripod, etc. 120 00

For Engineer's Dumpy Levels see page 343.
For Engineer's Y Levels see page 345.
For Architect's Y Levels see page 386.

BUILDER'S TRANSITS.



No. 5124.

(For Synopsis of Transits see page 384.)

5124. Builder's Transit (for repeating angles), achromatic terrestrial **telescope, 8 in.**, with dust cap and sun-shade, **object glass 1 in.** with rack-movement, eyepiece adjustable for focusing cross-hairs, long **spirit level** to telescope, graduated on the glass. **Clamp and improved Tangent screw** to telescope. Cloth-finished standards. **Horizontal limb 5 in.**, graduated to half-degrees, reading by **vernier** to one minute, vernier placed at about 25° with telescope. Two spirit levels to horizontal limb. All **tangent screws** with counter-spring, **four leveling screws, shifting centre.**

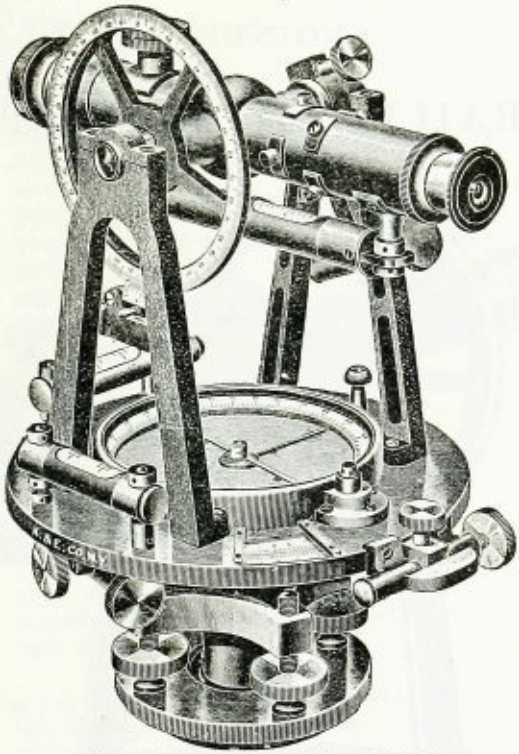
Instrument complete, with plumb bob, reading glass, adjusting pins, waterproof cover, etc., in polished mahogany Box and with No. 5175-1 Tripod . . . . . $ 85 00

5126. Builder's Transit as described under No. 5124, but with **vertical limb 3½ in.** diameter, graduated to degrees reading to five minutes. Instrument complete, with No. 5175-1 Tripod, etc. 95 00

Vertical limb **reading to one minute** . . . . . extra 5 00

Patent Extension Tripod like No. 5181, in place of regular tripod . . . . . " 6 00

BUILDER'S TRANSITS
with Compass.



No. 5129.

(For Synopsis of Transits see page 384.)

5127. **B**uilder's Transit (for repeating angles), achromatic terrestrial **telescope 8 in.** with dust-cap and sun-shade, **object glass 1 in.** with rack-movement, eyepiece adjustable for focusing cross-hairs. Long **spirit level** to telescope, graduated on the glass. **Clamp and improved Tangent screw** to telescope. Cloth-finished standards. **Compass** with raised ring, silvered, graduated to degrees, with **variation plate, needle** about **3 in. Horizontal limb 5 in.**, graduated to half-degrees reading to one minute, **vernier** placed at about 25° with telescope. Two **spirit levels** to horizontal limb. All tangent screws with counter-spring. **Four leveling screws. Shifting centre.**

Instrument complete, with plumb bob, reading glass, adjusting pins, waterproof cover, etc., in polished mahogany Box and with No. 5175-1 Tripod . . . . . $ 100 00

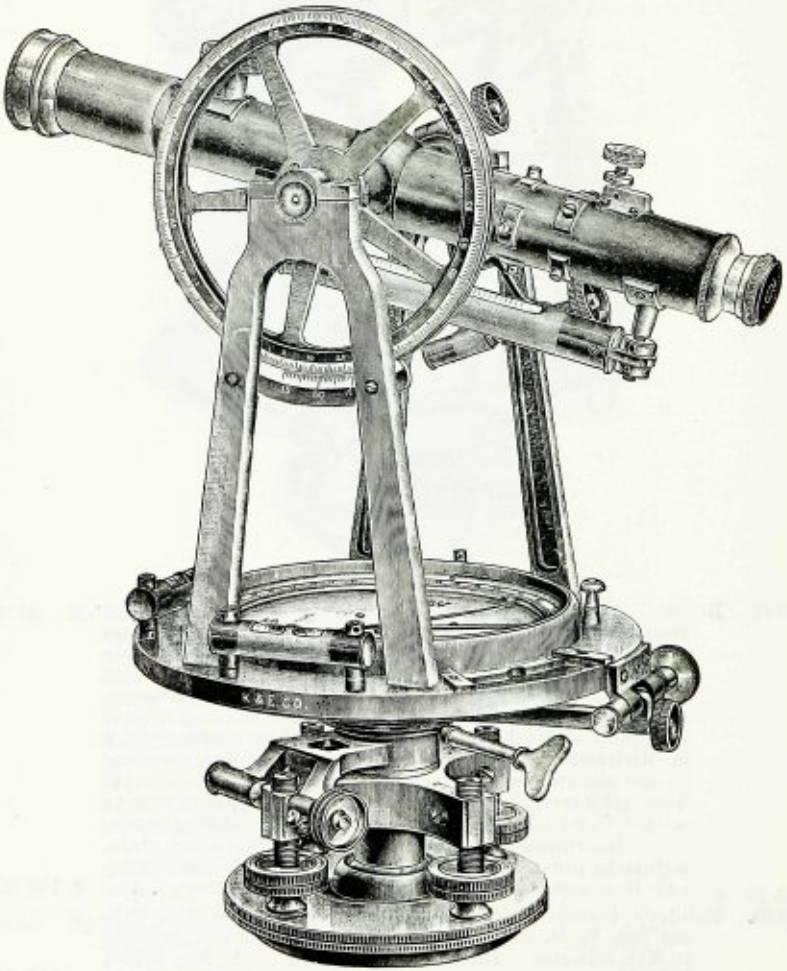
5129. Builder's Transit as described under No. 5127, but with **vertical limb 3½ in.** diameter, graduated to degrees, reading to five minutes. Instrument complete with No. 5175-1 Tripod, etc. 110 00

Vertical limb **reading to one minute** . . . . . extra 5 00

Patent Extension Tripod No. 5181 in place of regular Tripod . . . . . extra 6 00

ENGINEER'S

RAILROAD TRANSIT.



No. 5160.

ENGINEER'S

RAILROAD TRANSITS.

(For Synopsis of Transits see page 284.)

5130. Engineer's Railroad Transit (for repeating angles), achromatic terrestrial **telescope 11½ in.**, with dust cap and sun shade, **object-glass 1⅝ in.** with improved rack-movement, **eyepiece** with patent micrometer focusing arrangement with lock nut. Clamp and Tangent Screw of improved pattern with counter-spring. **Compass** with silvered raised ring, graduated to half-degrees, with **variation plate** set by capstan-head pinion. **Needle** about **5 in. Horizontal limb 6½ in.** graduated on solid silver to half-degrees, reading to one minute by two opposite verniers placed at about 30° with telescope, numbered like Fig. IV, page 336. Two **spirit levels** to horizontal limb, graduated on the glass. Improved tangent screws with counter-spring. Long centres. **Four leveling screws**; leveling arms adjustable for wear. **Shifting centre.**

Instrument complete, with plumb bob, reading glass, adjusting pins, water-proof cover, etc., packed in polished mahogany Box and with No. 5178 Split Tripod. . . . . $ 150 00

5140. Engineer's Railroad Transit, as described under No. 5130, but with **spirit level to telescope**, graduated on the glass.

Instrument complete, with No. 5178 Split Tripod, etc. 160 00

5150. Engineer's Railroad Transit, as described under No. 5140, but with **vertical arc 5 in.** diameter, graduated on solid silver to half-degrees, vernier reading to one minute.

Instrument complete, with No. 5178 Split Tripod, etc. 170 00

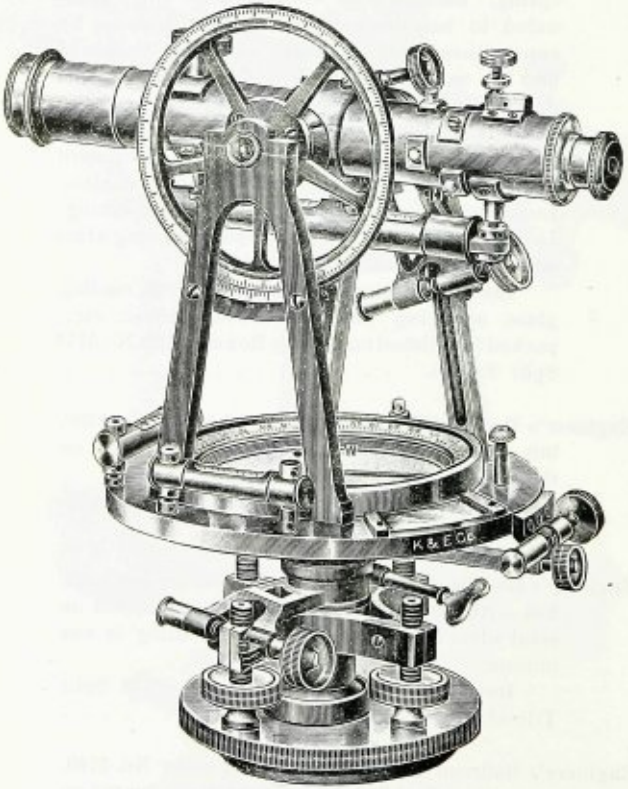
5160. Engineer's Railroad Transit, as described under No. 5140, but with **vertical limb 5 in.** diameter, graduated on solid silver to half-degrees with vernier reading to one minute.

Instrument complete, with No. 5178 Split Tripod, etc. 175 00

For extra fine Engineer's Transits see pages 353, etc.

ENGINEER'S

LOCATING TRANSIT.



No. 5165

ENGINEER'S

LOCATING TRANSIT.

(For Synopsis of Transits see page 384.)

5165. Engineer's Locating (also Mountain or Mining) Transit, (for repeating angles), achromatic terrestrial **telescope 9 in.** with dust cap and sun shade, **object glass 1 in.** with improved rack-movement, **eyepiece** with patent micrometer focusing arrangement with lock nut, Clamp and Tangent Screw of improved pattern with counter-spring. **Spirit level to telescope,** graduated on the glass, **vertical limb 4 in.** diam. graduated on solid silver to half-degrees, **vernier** reading to one minute. **Compass** with silvered raised ring graduated to half-degrees with variation plate set by capstan-head pinion. **Needle** about **3¾ in. Horizontal limb 5½ in.** graduated on solid silver to half-degrees reading to one minute by two opposite verniers placed at about 30° with telescope. Two **spirit levels** to horizontal limb, graduated on the glass. Improved **tangent screws** with counterspring. Long centres. **Four leveling screws;** leveling arms adjustable for wear. **Shifting centre.**

Instrument complete, with plumb bob, reading glass, adjusting pins, waterproof cover, etc., packed in polished mahogany Box, and with No. 5177 Split Tripod . . . . . $ 170 00

For extra-fine Mountain and Mining Transits see page 361.

For Engineer's Light Mountain Transit see pages 365, 375.

For Expedition Transit see page 369.

ATTACHMENTS AND PARTS

FOR TRANSITS, LEVELS AND COMPASSES.

FOCUS REDUCING LENSES.

5166	Focus Reducing Lens for sighting near objects . . . . each	$ 7 50
5166-2	do. do. do. do. set of two lenses . . . set	15 00

The range of adjustment for focus of the telescopes of our transits and levels permits sighting objects as near as 8 to 10 times the focal length of the object glass. To sight still nearer objects we furnish correction lenses which are slipped over the object glass like a metal cap and shorten the focus of the object glass, so that the telescope can be focused on a near object. Lens No. 5166 permits of sighting an object at a distance of about 4 feet, No. 5166-2 (the set of two lenses) at about 2½ feet distance.

In ordering these lenses give **exact** size of mount of object glass like for a cap for the telescope, state whether the telescope is erecting or inverting, and its length.



No. 5167-1.

5167- 1	Improved Sunshade with Reflector for illuminating cross and stadia hairs . . . . . each	$ 4 00

The reflecting mirror is rigidly mounted on a short tube, placed within the tube forming the sunshade, and held in position by a stop. To use the sunshade without the reflector, the mirror with its separate tube is taken out and the sunshade turned to bring the opening in its side away from the sun.

5167- 2	Sunshade, plain . . . . . each	$ 75
5167- 3	Object-glass. . . . . each	$ 6 00 to 10 00
5167- 4	Neutral glass, dark, to eyepiece . . . . . each	2 00
5167- 5	do. do. light, " " (ray filter) . . . . . "	2 00
5167- 6	Cap for object-glass . . . . . "	50
5167- 7	do. " eyepiece . . . . . "	75
5167- 8	Clamp screw for horizontal limb, centre or telescope . . . "	75
5167- 9	Tangent screw for " " " " " . . . "	1 50
5167-10	Leveling screws . . . . . "	1 50
5167-11	Compass needle and Centre Pin . . . . . 2 50 to	5 00
5167-12	Cover glass for compass, with ground edge . . . . . 50 to	1 00
5167-14	Steel adjusting Pins . . . . . each	05
5167-15	Phosphor—bronze adjusting Pins (non-magnetic, for variation plate) "	05
5167-16	Combination Screwdriver and Centre key . . . . . "	25
5167-17	Tripod head with Bolts for instruments with 4 leveling screws "	5 00
5167-18	do. do. do. do. for architect's levels "	3 00
5167-19	Legs for tripod No. 5175 . . . . . "	2 00
5167-20	do. " " No. 5176 . . . . . "	1 25
5167-21	do. " " No. 5177 . . . . . "	2 25
5167-22	do. " " No. 5178 . . . . . "	2 25
5167-23	do. " " No. 5180 . . . . . "	3 50
5167-24	do. " " No. 5181 . . . . . "	3 50
5167-25	Waterproof Cover for transit or level . . . . . "	75
5167-26	Leather Case with shoulder strap for transit or level	$ 12 00 to 15 00
5167-27	" " " " " for architect's level or surveyor's compass	5 00 " 10 00
5167-28	Fine Oil for surveying instruments . . . . . per bottle	25
5167-29	Pocket Oil cans . . . . . each	25

When ordering Attachments and Parts please give the serial number of the instrument.

For Tripods see pages 401, 402.

We have the best facilities for repairing Surveying Instruments of any make promptly and satisfactorily.

The following approximate prices represent the increase in cost of an instrument when it is made to order with the attachments or modifications here listed. Applying these extras to a finished instrument if they can be applied at all, may involve more work and consequent additional expense.

5167-40	Guard to vertical limb (see page 382)	$ 5 00
5167-41	Vertical Limb with 2 opposite Verniers and Guard, in place of regular vertical limb (see page 382) . . . . extra	20 00
5167-42	Vertical Limb and Vernier graduated on the periphery, with Guard, in place of regular vertical limb (see page 382) . . . . . "	15 00
5167-43	Vertical Limb with fully-encasing Metal Covering, with glass covered Vernier and ground glass Reflector, in place of regular vertical limb (see page 382) . . . "	18 00
5167-44	Solar Attachment (No. 5090, page 362) interchangeable to either top or end of axis of telescope, with detachable counter weight (see page 383)	70 00
5167-45	Transit with Angular Eyepiece instead of regular (see page 383) . . . . . extra	20 00
5167-46	Prism, with Colored Glass, to eyepiece of transit . . .	6 00
5167-47	Plain Cross-hairs and Diaphragm	2 00
5167-48	Replacing plain Cross-hairs on diaphragm	1 75
5167-49	Fixed Stadia and Cross hairs and Diaphragm	3 00
5167-50	Replacing Stadia and Cross-hairs on diaphragm	2 75
5167-51	Patent Adjustable Stadia hairs	5 00
5167-53	Disappearing Stadia hairs and Diaphragm	5 00
	If not ordered with the instrument, there is an additional charge of $3 00 for placing cross or stadia hairs into the telescope.	
5167-55	Improved Tangent screw with Gradienter	10 00
5167-57	do. do. do. " " " in place of plain tangent screw . . . . . extra	5 00
5167-60	Folding Sights to telescope	8 00
5167-61	Folding Sights to standards (at right angle to telescope)	10 00
5167-62	Mounted Microscopes to verniers . . . . . each	8 00
5167-63	Striding Compass for transits with U-shaped standards (see page 383), 4 in. needle.	15 00
5167-70	Graduating horizontal limb to 20 minutes, reading to 20 seconds	10 00
5167-71	" " " " 15 " " " 20 "	15 00
5167-72	" " " " 10 " " " 10 "	20 00
5167-73	Graduating vertical limb to 20 " " " 20 "	10 00
5167-74	" " " " 15 " " " 20 "	15 00
5167-75	" " " " 10 " " " 10 "	20 00

Graduations to read 20 seconds, should be applied only to the Extra-Fine Transits.

For Tripods see next page.

We have the best facilities for repairing Surveying instruments of any make promptly and satisfactorily.

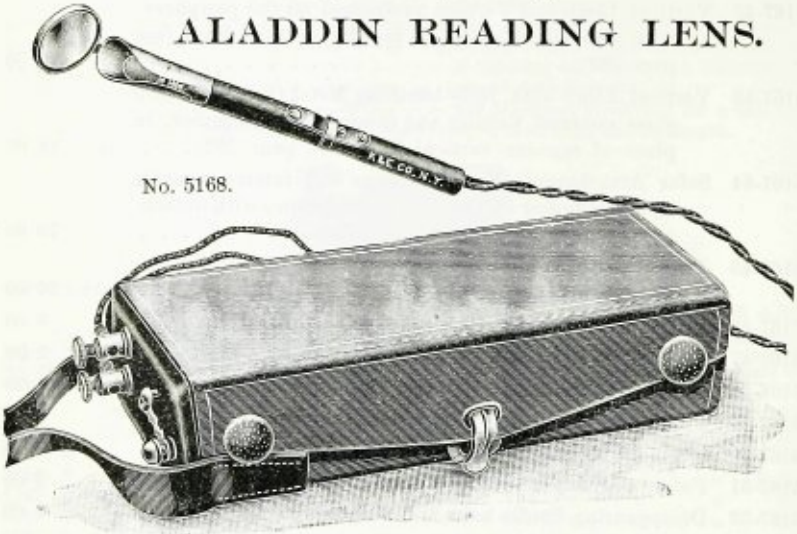
FINE SPIRIT LEVELS.

VERY SENSITIVE, GRADUATED ON THE GLASS.

5173 A.	Fine Spirit Levels for Telescope of 15 in. Levels . .	each	$ 4 00
5173 B.	" do. " " " 18, 20 or 22 in. Levels	"	5 00
5173 C.	" do. " " " Transits	"	3 00
5173 D.	" do. " " " Mining Transits . .	"	2 50
5173 E.	" do. " Plates of transits	"	1 00

Chambered Spirit Levels (for regulating the size of the bubble) and Reversible Spirit Levels quoted on application.

ALADDIN READING LENS.



No. 5168.

5168. Aladdin Reading Lens, (Patented) with electric lamp, silvered reflector, fine reading glass and 5-cell battery, in sewed leather Case, with shoulder strap . . . . . each $ 12 00

5168 B. Renewal Battery of 5 dry cells, in pasteboard box, for No. 5168, ready to slip into case . . . . . " 50

The Aladdin Reading Lens, will be welcomed by every engineer or surveyor who works in dark or badly lighted places, like mines, tunnels, forests, or at night, (polar observations, etc.).



It combines a small powerful electric lamp with a reflector and a reading glass, all so constructed that the fine readings of verniers of surveying instruments, graduations of tapes, etc., can be very conveniently and accurately observed in dark places. On removing the lens, the lamp is an excellent illuminator for the cross-hairs of telescopes. Its light is at the same time free from the danger of igniting gases, which makes it extra valuable in coal mines, etc.

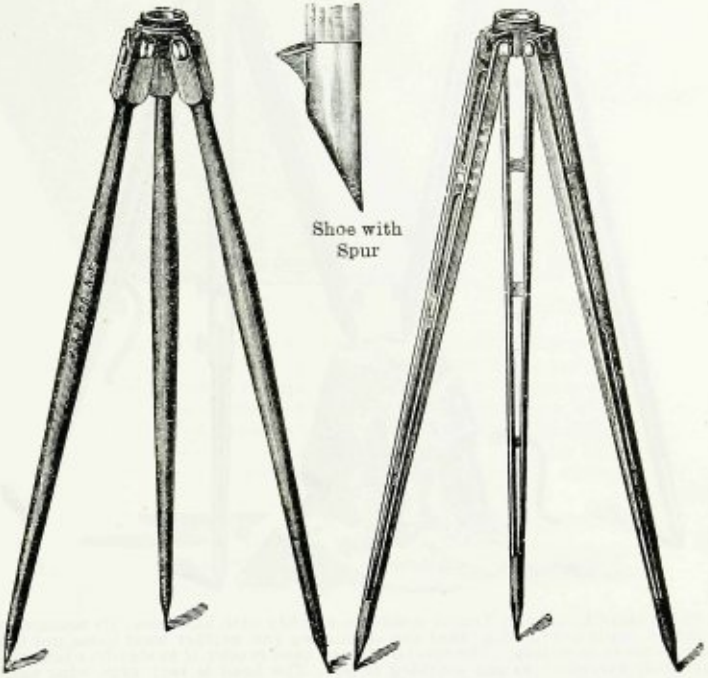
The Aladdin Reading Lens consists of a small incandescent lamp mounted on a light handle, 4½ in. over all. An adjustable bright metal reflector partly surrounds the lamp and carries a detachable fine magnifying lens. On the handle is a spring switch which permits of establishing electrical contact for short periods by the pressure of a finger or for longer periods by a clamping ring.

The battery (5 dry cells) is contained in a sewed leather case 7 × 3½ × 2 in., with shoulder strap. Renewal batteries are furnished in pasteboard box, ready to slip into the leather case. The complete outfit weighs about 2 pounds.

TRIPODS

FOR

LEVELS AND TRANSITS.



Shoe with Spur

No. 5175. 5178.

5175.	Hardwood Tripod for levels and transits	each	$ 10 00
5175-1.	Hardwood Tripod similar to No. 5175, for Builder's Transits	"	6 00
5176.	Hardwood Tripod, similar to No. 5175, for Architect's Levels, etc.	"	6 00
5177.	Split Tripod of hardwood, for light levels and transits, latest construction, very strong, extremely light and rigid.	"	10 00
5178.	Split Tripod of hardwood, for levels and transits, like No. 5177, but heavier	"	10 00
Any of the above tripods with spurs (see cut) for pressing the points into the ground		extra per tripod	1 00

For Patent Extension Tripods see next page.
For repair parts for tripods see page 398.

K & E PATENT EXTENSION TRIPODS.



This Patent Extension Tripod combines rigidity with lightness; its manipulation is easy and its construction such that the sliding leg can neither wear loose nor bind, but will always move smoothly. The special clamps used render it as steady, even when the legs are fully extended, as any solid-leg tripod. The head is very firm, wing nuts being used instead of tenon joints. It is adjustable to any height between 30 and 57 inches and weighs about 10 pounds.

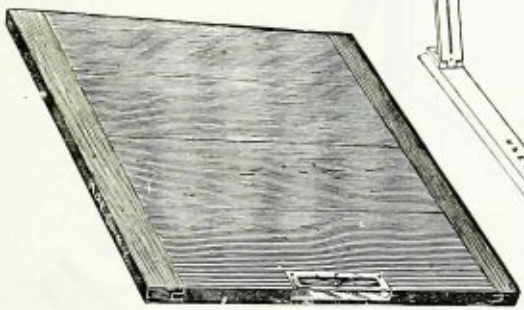
5180.	Patent Extension Tripod	each	$ 15 00
	if with instrument in place of regular tripod, extra	"	5 00
5181.	Patent Extension Tripod, like No. 5180, but lighter, for Builder's Transits.	"	12 00
	if with instrument in place of regular tripod, extra	"	6 00
5182.	Patent Extension Tripod, like No. 5180, but lighter, for Architect's Levels, etc., ...	"	12 00
	if with instrument in place of regular tripod, extra	"	6 00
5184.	Split Tripod with one extension leg and two split legs,	"	12 00
	if with instrument in place of regular tripod, extra	"	2 00
	Any of the above tripods with spurs (see cut page 401) for press-points into the ground . . . . . extra per tripod	"	1 00

Tripods No. 5184 have two split legs like No. 5178, and one patent extension leg like No. 5180. They offer nearly all the advantages of an extension tripod in using them on uneven ground, but they can not be put up as compactly for carrying.

For other Tripods see preceding page.

For repair parts for tripods see page 398.

TRAVERSE TABLES.





Tripod head of No. 5200.

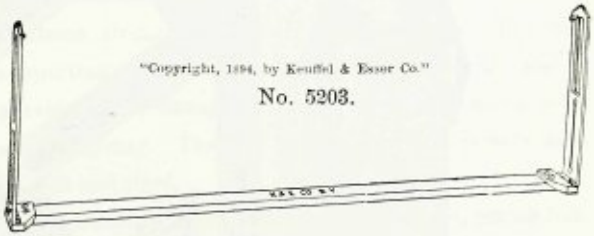
No. 5200. 5202

Old No.

5214 5200. Traverse Table, simple construction, best quality, pinewood drawing board, 15×15 in., with improved metal swiveling attachment for tripod. Fine trough compass set flush with board, needle about 3 in., jeweled centre, with stop. **Graduated** * brass alidade (No. 5202) 10¼ in., folding sights (alidade in sewed leather sheath). Tripod like No. 5176, stout swiveling discs, detachable clamp screw . . . . . each $25 00

5214 A. 5201. Traverse Table, like No. 5214, but with Patent Extension Tripod similar to No. 5182, page 402 . . . . . " 31 00

5202. Alidade for traverse table, brass, 10¼ in., **graduated,*** folding sights, in sewed leather Sheath . . . . . " 8 00



"Copyright, 1894, by Keuffel & Esser Co."

No. 5203.

5218 5203. Alidade for traverse table, brass, 12 × 1½ in., **graduated** * beveled edge in line of sight folding fore and back, sights 3 in. high, in sewed leather Sheath . . . . . each $ 15 00

*Unless another graduation is ordered, we graduate these alidades 40 parts to the inch.

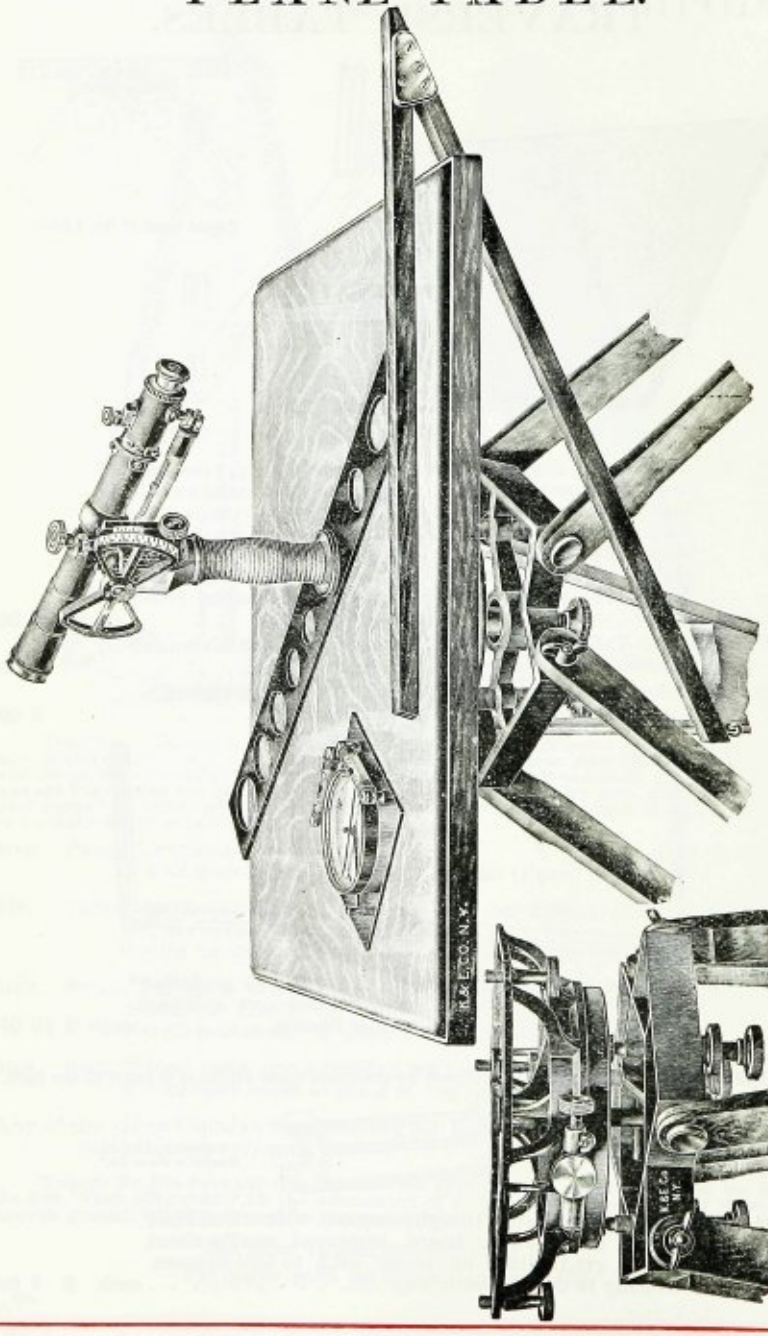
No. 5219.



Copyright, 1894, by Keuffel & Esser Co."

5219 5204. Compass for Plane Table (trough compass), with milled head screws to fasten to board, improved needle about 3½ in., graduations on raised limb to half-degrees, covering 10 degrees each way . . . . . each $ 7 00

PLANE-TABLE.



No. 5205.

Leveling arrangement of No. 5205

PLANE-TABLES.

5205. Plane-Table, alidade with achromatic terrestrial **telescope 11½ in.**, with clamp and improved tangent screw with counter spring, **object glass, 1¼ in.**, with improved rack movement, dust cap and sunshade; **eyepiece** with patent micrometer focusing arrangement with lock nut, fixed **stadia hairs.** Fine **spirit level** to telescope graduated on the glass. Double **vertical arc** (up to 30° each way) 4 in. diam., graduated to half-degrees, vernier reading to one minute. The vernier is hinged on pivots, so that it can be swung clear of the arc, to prevent wear while pointing the telescope. Vertical arc and vernier are graduated on their periphery. Bronzed brass **alidade blade 20 × 3 in.**, beveled fiducial edge. **Brass compass,** bronzed base, **5 × 5 in.**, two fine **spirit levels** graduated on the glass, **compass** graduated on raised ring to one degree, improved **needle about 3 in.**, with stop. **Drawing Board 18 × 24 in.**, of most substantial construction. **Three-screw leveling arrangement** of much improved pattern, which combines lightness, strength and ease of manipulation. The part supporting the board revolves in a metal socket and is provided with clamp and improved tangent screw with counter spring. The split hardwood tripod is very substantial and rigid.

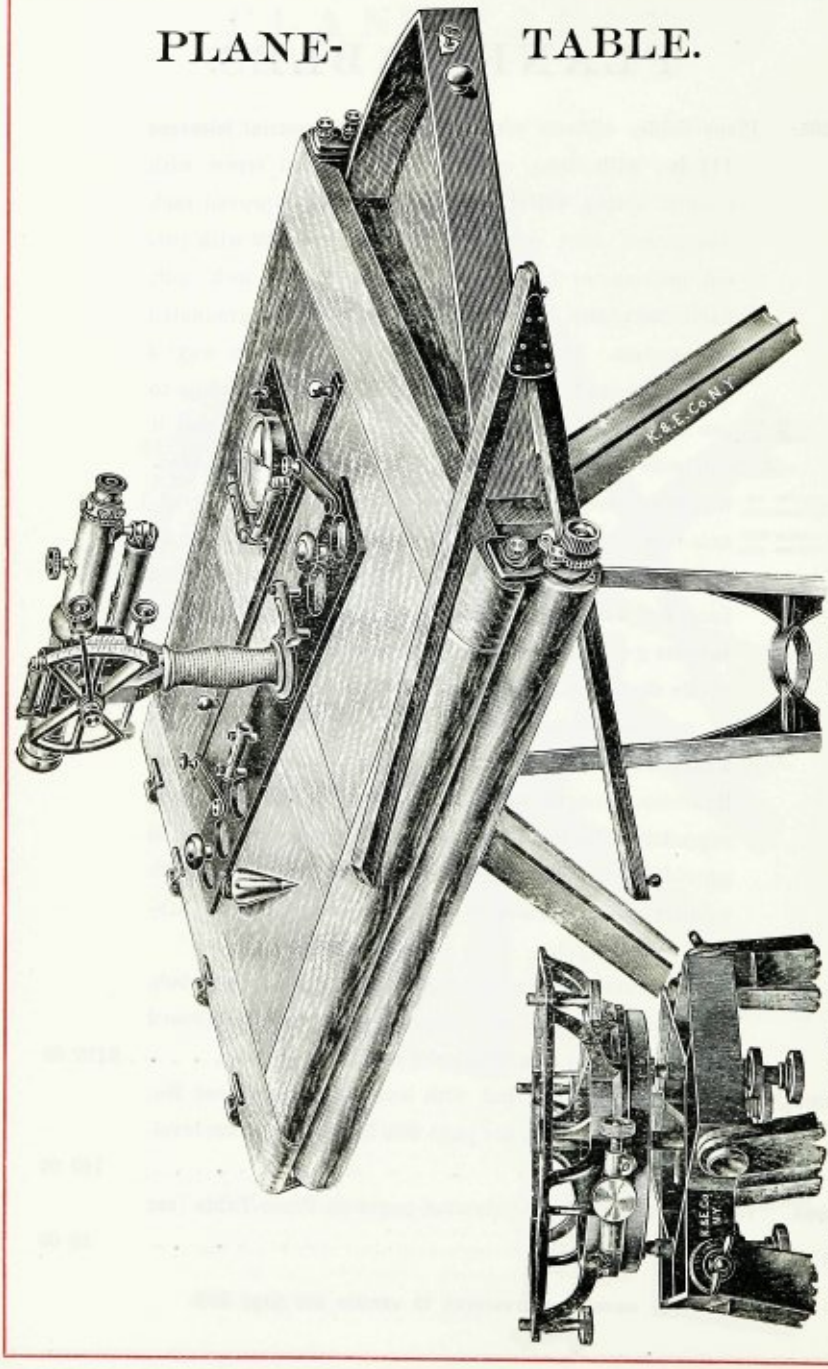
Instrument complete with plumbing arm, plumb bob, spring clips for holding paper, in two strong boxes (board in separate box) firm hardwood Split Tripod etc., ... $175 00

5205-J. Plane-Table No. 5205, but with leveling arrangement No. 5210, (after Johnson, see page 409) in place of above leveling arrangement 160 00

5209. Rollers for mounting continuous paper on Plane-Table (see cut page 408) extra 10 00

For mounted microscopes to vernier see page 399.

PLANE-TABLE.



No. 5206.

Leveling arrangement of No. 5206.

PLANE-TABLES.

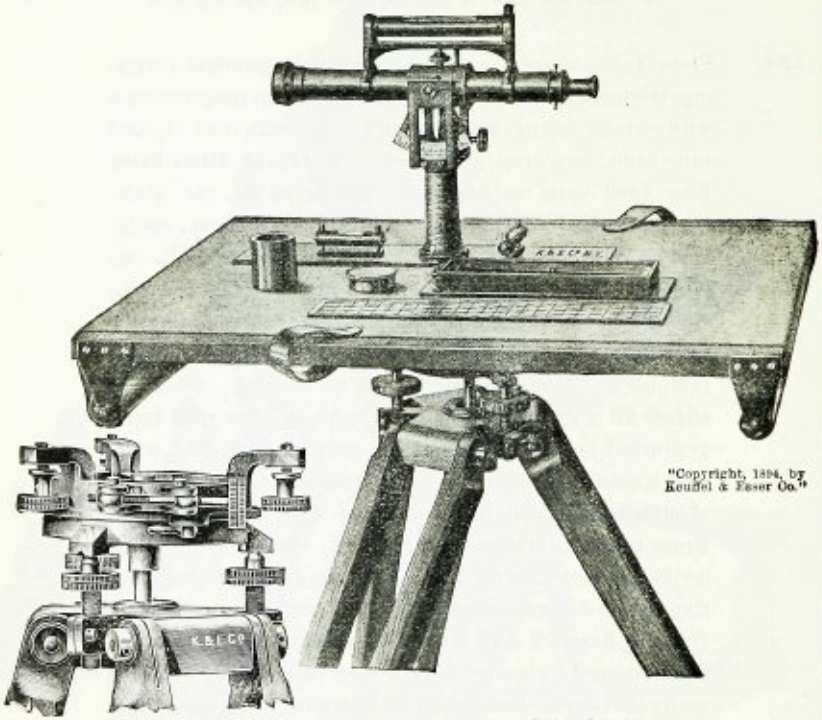
5206. Plane-Table, alidade with achromatic astronomical (inverting) **telescope 14 in.**, with clamp and improved tangent screw with counter spring, **object glass** $1\frac{5}{16}$ in., with dust cap and sun shade, improved rack movement. Fixed **Stadia Hairs.** Fine **Spirit Level** to telescope, graduated on the glass. Double **vertical arc** (up to 30° each way), **5 in. diam.**, graduated on solid silver to half-degrees, vernier reading to one minute. The vernier is hinged on pivots so that it can be swung clear of the arc to prevent wear while pointing the telescope. Vertical arc and vernier are graduated on their periphery. Mounted microscope to vernier. Blade of **alidade 20 × 2¾ in.**, bronzed brass, with two fine **spirit levels** graduated on the glass; folding parallel blade ¾ in. wide, with knobs and set screws, beveled fiducial edge, under side of alidade and parallel blade lined with white xylonite. Brass **compass, bronzed, base 5 × 5 in.**, with two fine spirit levels, graduated on the glass. Compass graduated on raised ring to one degree, improved **needle** about **3 in.**, with stop. Drawing **Board 22 × 28 in.** of most substantial construction, sector-shaped swinging drawer with lock and key pivoted under the board. Two rollers for mounting continuous paper on the board, with ratchet. (The rollers can be detached from the board). The **three-screw leveling arrangement** is of improved pattern, which combines lightness, strength and ease of manipulation. The part supporting the board revolves in a metal socket, and is provided with clamp and tangent screw of improved pattern, with counter spring. The very substantial hardwood tripod has two split legs and one extension leg.

Instrument complete, with plumb bob, plumbing arm, 4 spring clips for holding paper, in two neat strong boxes, board in separate box, with strong hardwood Split Tripod, etc., ... $ 300 00

5206 J. Plane-Table No. 5206, but with leveling arrangement No. 5210 (after Johnson, see page 409) in place of above leveling arrangement 285 00

PLANE-TABLES.

U. S. Coast and Geodetic Survey Pattern.



Leveling Arrangement of No. 5208, No. 5208 with No. 5209,

5208. Plane-Table, as made by us for the U. S. Coast & Geodetic Survey, alidade with achromatic astronomical (inverting) **telescope 10½ in.**, with clamp and improved tangent screw with counter spring, **object glass 1 in.**, with improved rack movement, dust cap and sun shade, fixed **stadia hairs.**

The telescope is mounted in a sleeve and is adjustable to bring the cross hairs vertical and horizontal. Fine striding **spirit level** to telescope, graduated on the glass, **vertical arc** (up to 30° each way), **4 in. diameter**, graduated on solid silver to half-degrees, vernier reading to one minute. Bronzed brass **alidade blade 12×2½**, 2 fine spirit levels graduated on the glass. **Compass** covering 20°, graduated to half-degrees, improved **needle** about **5½ in.**, with stop. German Silver **Diagonal Scale** 10¼×2 in., one side graduated 1:10,000, other side 1:20,000. **Drawing Board 16×20 in.**, of most substantial construction. The three-screw leveling arrangement with tangent screw is of excellent design. Strong hardwood Split Tripod.

Instrument complete with plumbing arm, plumb bob, spring clips for holding paper, in two strong boxes, (board in separate box), firm hardwood Split Tripod $175 00

5208J. Plane-Table No. 5208, but with Leveling Arrangement No. 5210 (after Johnson, see page 409) in place of above leveling arrangement 165 00

5209. Rollers for mounting continuous paper on plane-table (see cut) . . . . . extra 10 00

PLANE-TABLE LEVELING ARRANGEMENT

(after Johnson)



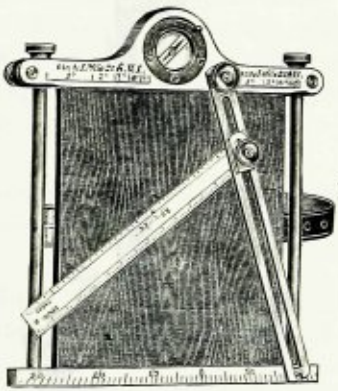
No. 5210.

(The cut shows one leg of the tripod removed to afford a better view of the construction).

5210. Leveling arrangement (after Johnson) very simple and efficient, consists of two sphere-segments movable within one another and two wing nuts, one to keep the segments in apposition, the other to clamp them. With stout split hardwood Tripod $45 00

This leveling arrangement is furnished with Plane-Tables, Nos. 5205 J, 5206 J and 5208 J.

CAVALRY SKETCHING CASE.



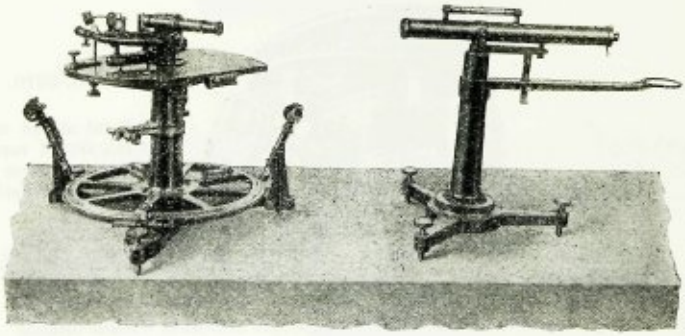
No. 5212.

5212. Cavalry Sketching Case, as made by us for the U. S. Army. Board 6¾x7½ in., rollers for paper, with set screws, swiveling Handle Strap. . . . . each $15 00

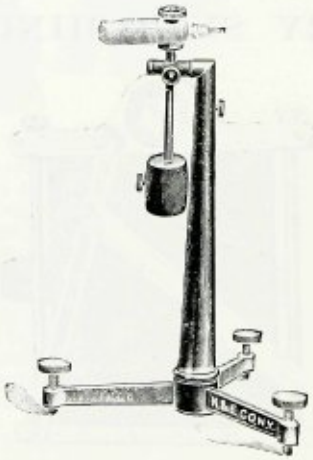
The compass is set flush, numbered at every 5° up to 180°, compass cover with scores, stop to needle. Brass Scale Arm and Scale connected by sliding block with clamp screw.

Scale 7 in., graduated 3 inches to the mile and inches in 10ths. Clinometer Scale graduated to one degree. Scales of Vertical Intervals on upper cross piece, 2, 3, 4, 6 inches to the mile. Two wooden tubes, with retaining springs, for 4 pencils, on back of board.

SEXTANTS AND OCTANTS.

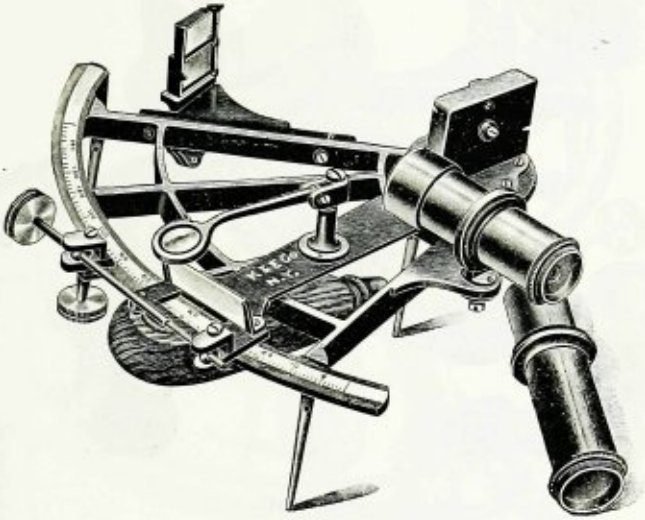


The above illustration shows a very delicate instrument designed and built by us, for testing sextants for eccentricity and errors of graduation, which enables us to determine the correctness of sextants and octants. We made a duplicate of this instrument for the U. S. Navy, to which we furnish sextants and octants.



No. 5220.

5220. Stand for Sextants, bronzed brass, 15 in. high, 3 leveling screws. The stand can be unscrewed at the tripod, to store it in its hardwood Case . . . . . each $ 35 00



No. 5223B.

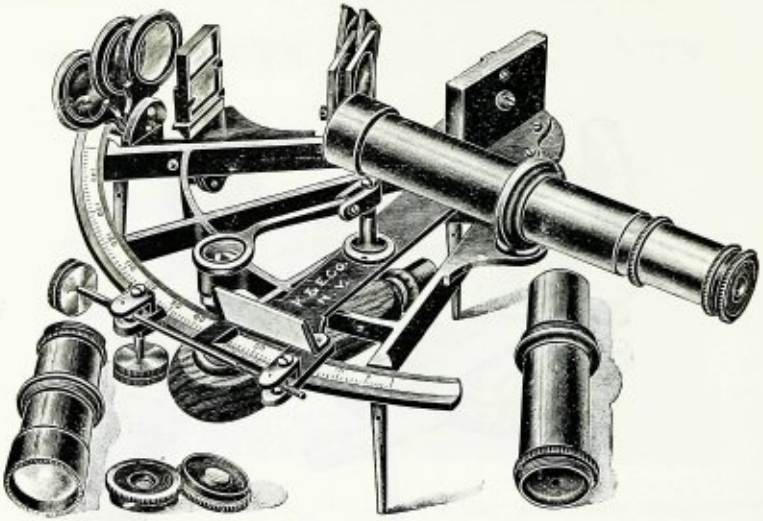
5223. Sextant for Land Surveying, gun metal, measuring angles up to 130 degrees. Radius 6 in., graduations on solid silver to 20 minutes, vernier reading to 30 seconds, clamp and tangent screw to vernier. Mounted reading lens. Plain sighting tube.

Instrument complete, with adjusting key and screw-driver, in polished mahogany Case with Lock . . . . . each $42 50

5223 B. Sextant for Land Surveying, like No. 5223, with plain sighting tube and star telescope.

Instrument complete, as above. . . . . " 52 50

We have special apparatus, (see page 410) for testing sextants of any make for eccentricity and errors of graduation. As large manufacturers, we have the best facilities for repairing sextants.



No. 5224C.

5224. Sextant, Mariner's, gun metal, measuring angles up to 130 degrees. Radius 6 in., graduations on solid silver to 20 minutes, vernier reading to 30 seconds, clamp and tangent screw to vernier. Mounted reading lens. 1 plain sighting tube, 1 inverting telescope (power about 6 diam.), 2 neutral glasses for telescope, 7 neutral glasses to sextant.

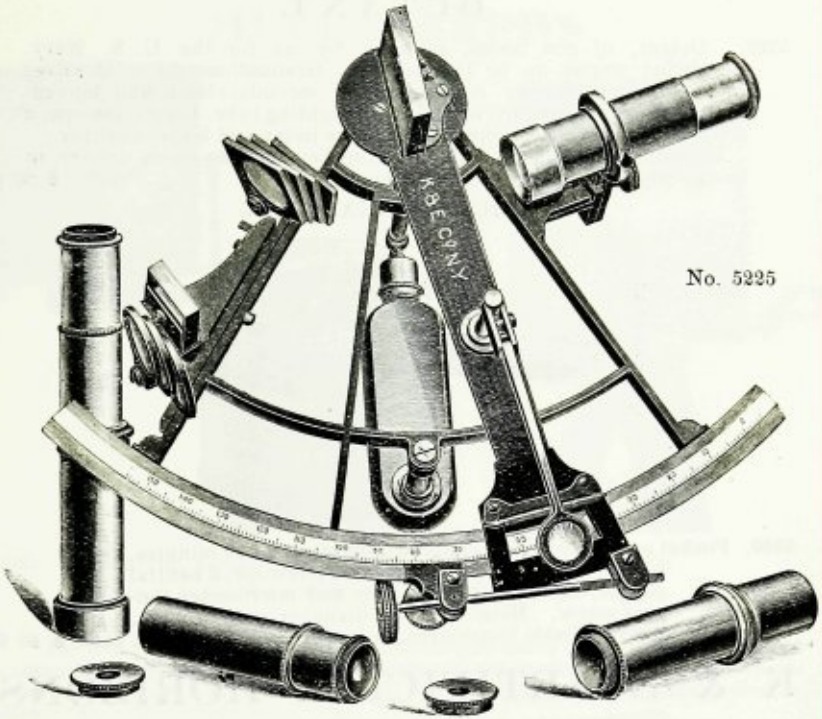
Instrument complete, with adjusting key and screw-driver, in polished mahogany Case with Lock . . . . each $ 65 00

5224 B. Sextant, Mariner's, like No. 5224, but with **adjustable telescope holder.** Instrument complete, as above . . . " 70 00

5224 C. Sextant, Mariner's, gun metal, measuring angles up to 130 degrees. Radius 6 in., graduations on solid silver to 20 minutes, vernier reading to 30 seconds, clamp and tangent screw to vernier. Mounted reading lens. 1 plain sighting tube, 1 inverting telescope (power about 6 diam.), 1 star telescope; 2 neutral glasses for telescope, 7 neutral glasses to sextant.

Instrument complete, with adjusting key and screw-driver, in polished mahogany Case with Lock . . . . . " 75 00

5224 D. Sextant, Mariner's, like No. 5224C, but with **adjustable telescope holder.** Instrument complete, as above . . . " 80 00



No. 5225

5225. Sextant, high grade, gun metal, as made by us for the U. S. Navy; measuring angles up to 130 degrees. Radius 7½ in. Graduations on solid silver to 10 minutes, vernier reading to 10 seconds; magnifying glass, clamp and tangent screw to vernier. 1 sighting tube, 1 star telescope, 1 inverting telescope with two eyepieces magnifying powers 6 and 12 diam.; 7 neutral glasses to sextant, 2 neutral glasses for telescopes, 1 each spare index and horizon mirror.

Instrument complete, with adjusting key and two screw drivers, in fine polished mahogany Case with Lock . . . . . each $ 120 00

5227. Surveying Sextant, of gun metal, as made by us for the U. S. Navy, measuring angles up to 145 degrees. Radius 6 in. Graduations on solid silver to 20 minutes, vernier reading to 30 seconds; magnifying glass, clamp and tangent screw to vernier. 1 sighting tube, 1 star telescope, one inverting telescope magnifying power 6 diam., 7 neutral glasses to sextant, 2 neutral glasses for telescope 1 each spare index and horizon mirror.

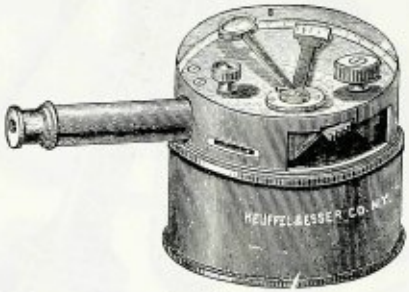
Instrument complete, with adjusting key and two screw drivers, in polished mahogany Case with Lock . . . . . each $ 90 00

We have special apparatus, (see page 410) for testing sextants of any make for eccentricity and errors of graduation. As large manufacturers, we have the best facilities for repairing sextants.

OCTANT.

5229. Octant, of gun metal, as made by us for the U. S. Navy, measuring angles up to 100 degrees. Graduations on solid silver to 20 minutes, vernier reading to 30 seconds; clamp and tangent screw to vernier, magnifying glass. 1 sighting tube, 1 star telescope, 2 neutral glasses for telescope, 1 each spare index and horizon mirror.
Instrument complete, with adjusting key and two screw drivers, in fine polished mahogany Case with Lock . . . . . each $ 80 00

POCKET SEXTANT.

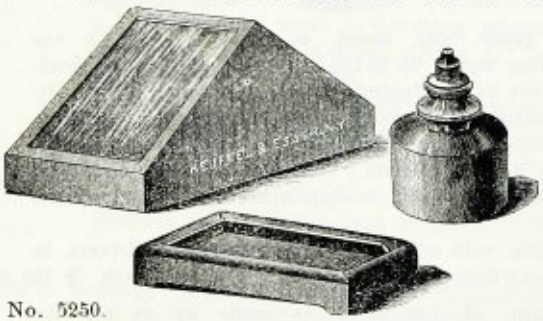


"Copyright, 1885, by Keuffel & Esser."

No. 5240.

5240. Pocket or Box Sextant, graduated on silver to 30 minutes, vernier reading to 1 minute, good telescope, 2 neutral glasses, mounted reading lens and micrometer tangent screw. Metal box 3 in. diameter × 1½ in. high, a very reliable instrument, in leather Sling Case . . each $ 40 00

K & E ARTIFICIAL HORIZONS



No. 5250.

"Copyright, 1887, by Keuffel & Esser."

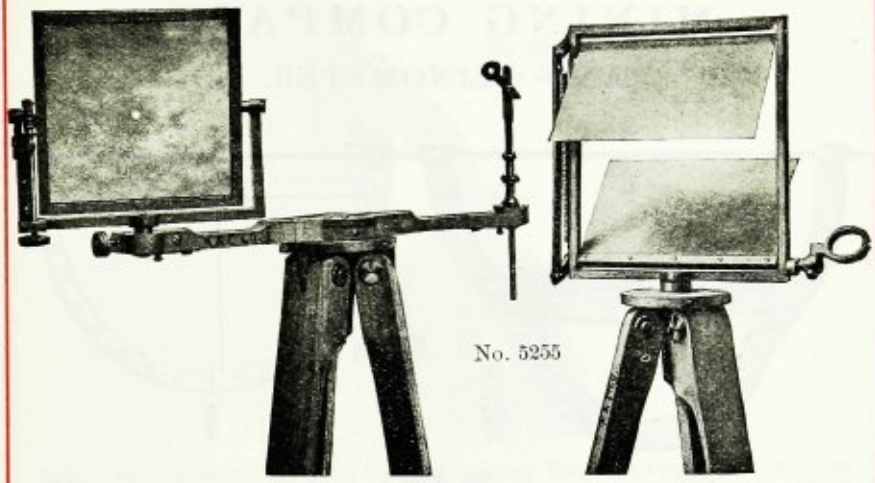


No. 5251.

5250. Mercurial Horizon, as made by us for the U. S. Navy. Bronzed brass roof 3¾ x 7¼ in. x 4½ in. high, fine plane glasses 2¾ x 4⅝ in., iron mercury bottle with threaded stopper and funnel top. Iron mercury trough with thread for funnel, and lip. Polished mahogany Case, with carrying strap. Complete, with mercury . . . . . each $35 00

5251. Reflecting Horizon, black glass plane accurately ground and polished, diam. 3⅜ in., mounted in bronzed brass frame, with three leveling screws, fine graduated **adjustable** spirit level in bronzed metal mounting, polished mahogany Case . . . . . " 16 00

HELIOGRAPHS



No. 5255

5255. Heliograph, as made by us for the U. S. Signal Service: outfit complete for one station, with Directions . . . . . $ 60 00

The Heliograph consists of 2 mirrors, 5 x 5 in. (only one of which is shown in the cut), a mirror bar 12 in. long, a sighting rod with movable disc, a screen 6½ x 7¼ in. and 2 hard-wood tripods standing about 40 in. high, all of the best material and construction, in leather Case with carrying strap.

Descriptive Circular sent on Application.

SUN-DIALS.



No. 5270.

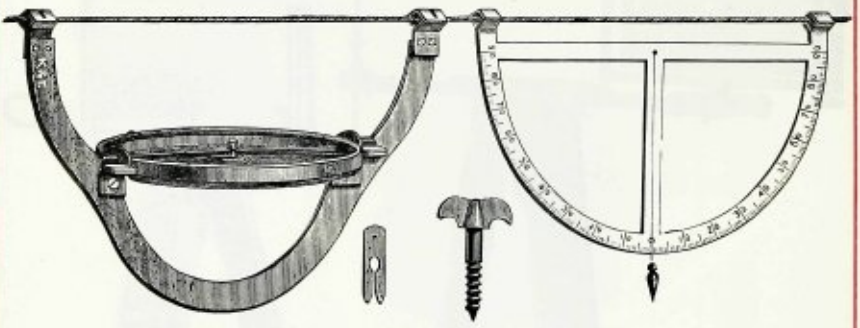


No. 5275.

5270. Universal Sun-dial and Compass for both North and South Latitudes, best make, 2½ in., in morocco Case . . . each $ 14 80

5275. Sun-dial and Compass, watch pattern, German silver, 2 in. " 3 50

MINING COMPASS
AND CLINOMETER.

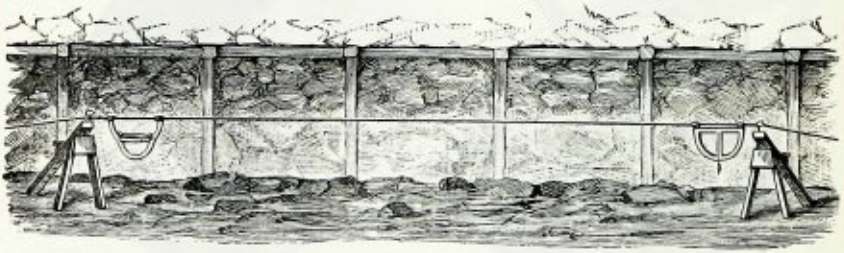


No. 5280.

5280. Mining Compass and Clinometer, Compass graduated to half-degrees, suspended in a frame with hooks, by a universal joint (gimbal), needle about 3 in., with stop. Clinometer 7 in. diameter, graduated to half-degrees, with hooks and plumb bob, screws for cord, brass stop, in chamois lined leather Sling Case . . . . . each $ 50 00

5280B. Station bucks . . . . . per pair 4 00

5280C. Water-proof cord, 80 feet, on reel 3 00



Mining Compass and Clinometer in use.

MINING LAMP AND PLUMMET.



No. 5285
with 5289

5285. One Plummet, about 6½ in., in mahogany Box with strap, each $ 10 00
5286. Two do. in one mahogany Box with strap . . . . . pair 18 00

This is a large brass Plummet 2 in. diameter, 6½ in. long, with steel point, weight about 20 oz., mounted in universal joint (gimbal) with chains for suspending. The upper part is hollow, for oil, and provided with a burner, forming a lamp. The sight is taken to centre of flame.

5288. Standard for suspending Plummet, on plain tripod like No. 5176 . . . . . each $ 15 00
5289 do. do. do. on extension tripod like No. 5182. " 21 00

MINER'S COMPASSES.



No. 5290.

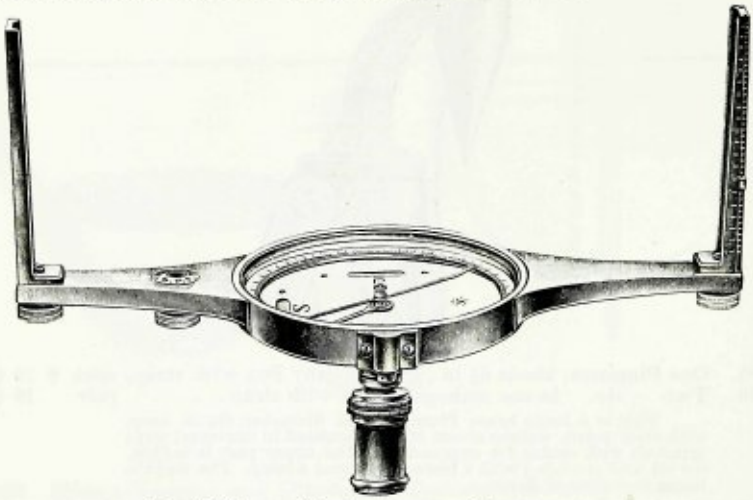


No. 5293.

5290. Miner's Compass or Dipping Needle, 3¾ in., with Norwegian needle about 3 in., with stop; glass and brass covers on both sides, ... each $ 14 00
5293. Miner's Compass or Dipping Needle, 3¾ in., needle about 3 in., with stop, glass and brass covers on both sides, " 12 00

SURVEYING COMPASSES.

In Surveying Compasses the East and West lettering is reversed from its position on the map. This is because the needle is the fixed point while the compass-box is revolved in directing the sights to the object observed. For instance, in sighting a point situated N W. the needle will point N. E., but it will correctly read N. W. in accordance with the line actually sighted, because the East quadrant is marked West.



No. 5306, but with Out-keeper, No. 5312.

5300. Large Surveying Compass, bronzed, graduated to half-degrees, numbered in quadrants, needle about 4 in., plate 12 in., graduated sights, 2 spirit levels, Ball joint and Socket for Jacob staff mounting, in polished mahogany Box with handle . . . . . each $ 25 00

5302. do. do. needle about 5 in., plate 14 in., " 30 00

5304. do. do. " " 6 " " 16 " " 35 00

5306. Large Surveying Compass, like No. 5300, but with variation plate reading to minutes . . . . . each $ 30 00

5308. do. do. like No. 5302, but with variation plate, " 35 00

5310. do. do. " " 5304, " " " " " 40 00

The Surveying Compasses No. 5300 to 5310 represent the latest construction of these instruments, which we have improved in very many features.

The compass box is sunk flush with the plate instead of projecting above it. The graduations, to half-degrees, are on a raised ring and the needle is of our improved pattern, as described on page 333. One of the detachable sights is graduated and provided with a sliding cross-piece for measuring vertical angles.

The variation of the needle is set off by a capstan-head pinion. The vernier of the variation arc reads to minutes. With these compasses we furnish adjusting pins of phosphor bronze, which do not disturb the needle.

5312. Out-keeper (tally register) . . . . . extra $ 1 50

The Out-keeper is shown in above cut, but is not included in the price of the Compasses.

For Tripods for above see page 421.



No. 5321.

5320. Surveying Compass, with folding sights, graduated on raised ring to degrees, variation plate, two spirit levels, Ball joint and Socket for Jacob staff mountings, needle about 3½ in., in polished mahogany Case . . . . . each $ 16 00

5321. do. do. like No. 5320, but needle about 4 in., in polished mahogany Case . . . . . " 18 00

5322. do. do. like No. 5320, but needle about 4½ in., in polished mahogany Case . . . . . " 20 00

Compasses No. 5320 to 5322 are of the most practical construction and very carefully and substantially made. The variation of the needle is set off by means of a pinion with capstan-head, which admits of very precise adjustment. With these compasses we furnish adjusting pins of phosphor bronze, which do not disturb the needle.

Sewed leather Sling Case **in place of mahogany case.**

for Compasses	2	2½	3	3½	4	4½ in.
extra each	$ 2 00	2 00	2 25	2 50	3 00	3 25

For Jacob Staffs and Tripods see page 421.



as Compass.

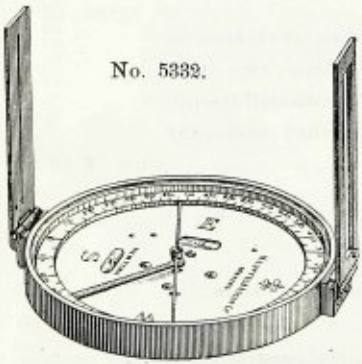


as Clinometer.

No. 5330.

5330. Surveying Compass and Clinometer, bronzed, graduated to degrees, with folding sights ending in hooks, fiducial edge for clinometer, with Ball joint and Socket for Jacob staff mounting,
needle about 2 in., in mahogany Case, each $12 50
5331. do. do. " " 2½ " " " " " 14 50

No. 5332.





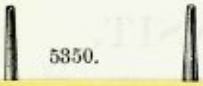
No. 5335.



5332. Surveying Compass, graduated on raised ring to degrees, with folding sights, 2 spirit levels, Ball joint and Socket for Jacob staff mounting.
needle about 3 in., in mahogany Case, each $ 10 50
5333. do. do. " " 3½ " " " " " 11 50
5334. do. do. " " 4 " " " " " 13 00
5335. Surveying Compass, like No 5332, but without spirit levels, needle about 2½ in., in mahogany Case, each $ 8 00
5336. do. do. " " 3 " " " " " 9 00
5337. do. do. " " 3½ " " " " " 11 00
5338. do. do. " " 4 " " " " " 11 50

For Leather Cases in place of mahogany, see page 419.

JACOB STAFF AND TRIPODS



5350.



5355.

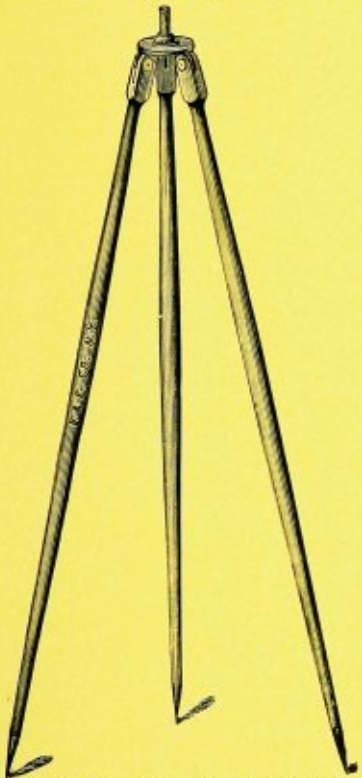


5358

ron shoe . . . . . each $1 00
taff head, light, for com- . . . . . " 3 00
top with threaded socket s No. 5300 to 5338 . . . " 5 00
ound, cane pattern, ball rew cap for top, for No. s 5370, 5375, 5400, etc., . " 12 50

d see No. 5182 page 402.

Please insert at page 421, Catalogue of 1909.



No. 5356 Tripod, hardwood, with brass staff-head top, for Compasses 5320 to 5338. each $ 5 00

Please note that tripods No. 5355 (with threaded socket for ball joints) fit only compasses No. 5300 to 5310.

Keuffel & Esser Co.

KET TRANSIT

(Patented.)



This instrument takes the place of a Sighting Compass, and Clinometer. It weighs about 8 oz.

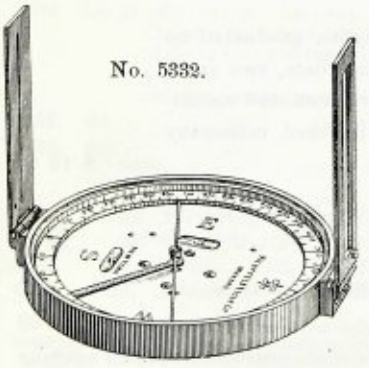
5368 Brunton Patent Pocket Transit . . each $25 00
5368 S. Sling Case for No. 5368 " 2 00



as Compass.

No. 5330.

5330. Surveying Compass and Clinometer, bronzed, gr
degrees, with folding sights ending in hoo
edge for clinometer, with Ball joint a
for Jacob staff mounting,
needle about 2 in., in mah
5331. do. do. " " 2½ " " "



No. 5332.



5332. Surveying Compass, graduated on raised ring
with folding sights, 2 spirit levels, Ba
Socket for Jacob staff mounting.
needle about 3 in., in mahogany Case, each $ 10 50
5333. do. do. " " 3½ " " " " " 11 50
5334. do. do. " " 4 " " " " " 13 00
5335. Surveying Compass, like No. 5332, but without spirit
levels, needle about 2½ in., in mahogany Case, each $ 8 00
5336. do. do. " " 3 " " " " " 9 00
5337. do. do. " " 3½ " " " " " 11 00
5338. do. do. " " 4 " " " " " 11 50

For Leather Cases in place of mahogany, see page 419.

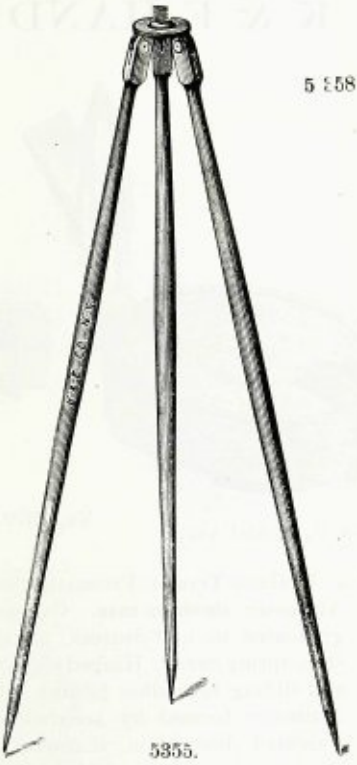
JACOB STAFF AND TRIPODS



5350.



5351.



5355.



5358.

5350.	Jacob Staff, 54 in., hardwood, iron shoe	each	$1 00
5351.	Tripod, hardwood, with Jacob staff head, light, for compasses No. 5320 to 5338	"	3 00
5355.	do. hardwood, with brass top with threaded socket for ball joint of Compasses No. 5300 to 5338 . . .	"	5 00
5358.	do polished mahogany, round, cane pattern, ball joint with socket, metal screw cap for top, for No. 5330, 5331, and instruments 5370, 5375, 5400, etc., .	"	12 50

For Patent Extension Tripod see No. 5182 page 402.

BRUNTON POCKET TRANSIT



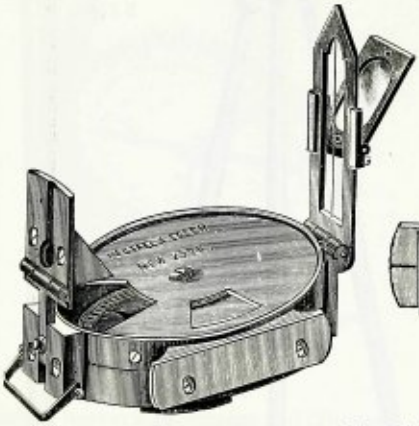
(Patented.)

This instrument takes the place of a Sighting Compass, and Clinometer. It weighs about 8 oz.

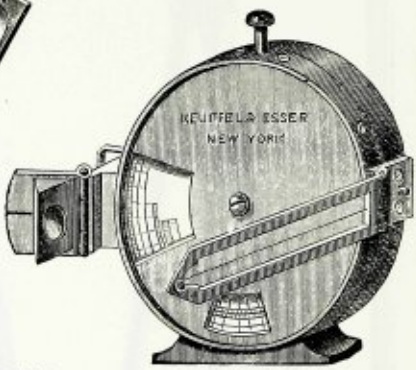
5368 Brunton Patent Pocket Transit . . each $25 00

5368 S. Sling Case for No. 5368 " 2 00

K & E HAND TRANSIT.



For Horizontal Angles



For Vertical Angles

No. 5370.

5370. K & E Hand Transit, Prismatic Compass, Clinometer and Altimeter, **aluminum case.** Compass dial $2\frac{3}{4}$ in. diameter graduated to half-degrees, jeweled centre, automatic stop, spring check. Hinged sight-vane with vertical wire and sliding reversible folding mirror. Clinometer and Altimeter formed by accurately balanced, sensitive, weighted disc, $2\frac{3}{4}$ in. diameter, with stop and spring check, giving angles of elevation or depression in half-degrees, and slopes in feet per 100 ft. horizontal or centimeters per meter. Fiducial edge for clinometer. Socket for mounting on staff. With Directions . . . . each $ 25 00

5370S. Sewed leather Sling Case for No. 5370 . . . . . " 3 00

To take the **horizontal** bearing of an object much above or below the plane of the observer the sight vane is provided with a folding adjustable mirror which can be placed with its face up or down, for sighting points much above or below the observer. It slides on the sight vane with sufficient friction to remain stationary where placed.

The prism and the sight vane fold down, to store the instrument in its sewed leather case.

As the K & E Hand Transit reads angles in the **horizontal and in the vertical** plane and gives magnetic bearings it is a useful instrument for rapid approximate work (preliminary surveying) or for filling in the details of larger surveys made with a transit.

It is also used like a hand compass for rapid work (like in military surveying). By placing the instrument on a Tripod or Jacob staff its accuracy is increased. For very close work, the mean of repeated observations is taken.

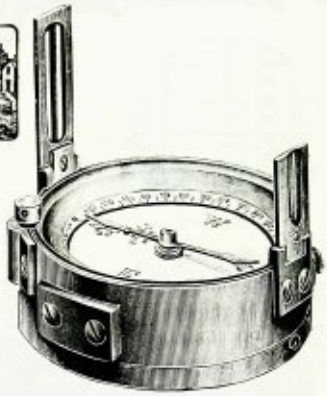
K & E POCKET TRANSIT.



Clinometer side



Appearance of field



Compass.

No. 5373.

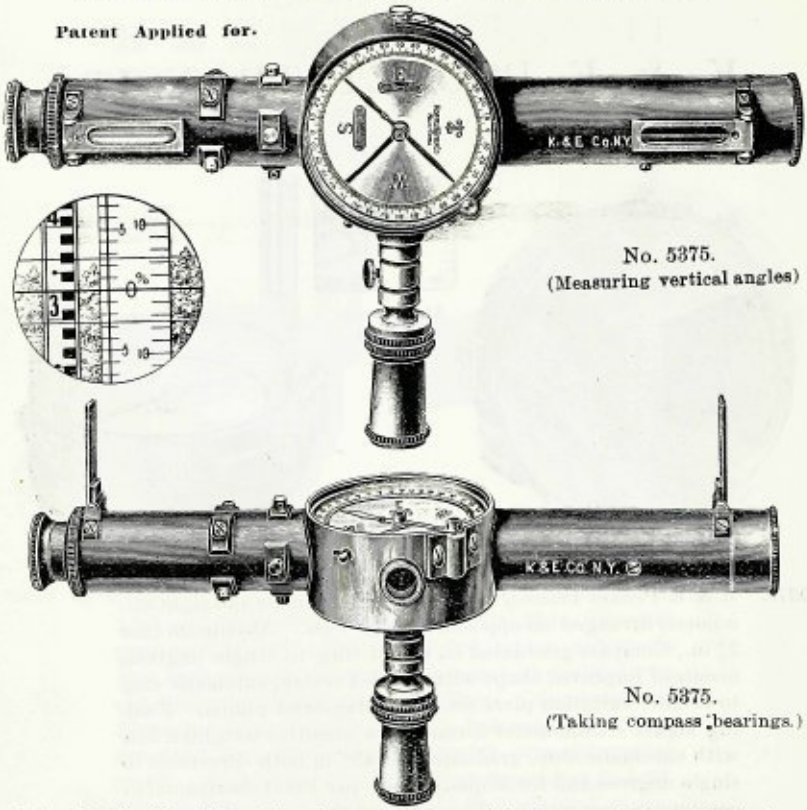
5373. K & E Pocket Transit, combined sight compass and sight clinometer arranged on opposite sides of case. Aluminum case 2¼ in., Compass graduated on raised ring to single degrees, needle of improved shape with jeweled centre, automatic stop to needle, variation plate set by capstan-head pinion. Folding sights. Clinometer formed by a sensitive weighted disc with automatic stop, graduated for 45° in both directions to single degrees and for slopes in feet per 100 ft. horizontal or centimeters per meter. The scale readings and the sighted object, are seen simultaneously (see cut). Fiducial edge (foot) for using instrument as contact clinometer. Adjusting pins of phosphor bronze (which will not disturb the needle) for setting the variation plate. Instrument in sewed leather Sling Case . . . . . .each $ 18 00

This is the most practical instrument for quickly determining vertical and horizontal angles and compass bearings. Vertical angles and slopes are read on the scale of a sensitive accurate pendulum disc. The results obtained are amply accurate for preliminary work, and as close as accurate graduations, careful centering and a perfect magnetic needle can make them in an instrument of this size.

The instrument is very substantially constructed, and will stand the rough usage incidental to the purposes for which it is intended.

STADIA HAND TRANSIT.

Patent Applied for.



No. 5375.
(Measuring vertical angles)

No. 5375.
(Taking compass bearings.)

5375. Stadia Hand Transit, achromatic terrestrial telescope 10 in., object glass 1 in., with cross hairs, and stadia hairs adjusted to read 1:100, folding sights Clinometer and Altimeter formed by accurately balanced sensitive weighted disc with automatic stop, gives vertical angles to single degrees and slopes in feet per 100 feet horizontal or centimeters per meter. Compass $2\frac{3}{4}$ in., graduated on silvered raised ring to single degrees, variation plate set by capstan-head pinion, improved needle with jeweled centre, 2 spirit levels. Ball joint and socket. Adjusting pins of phosphor bronze (which will not disturb the needle) for setting variation plate. In velvet lined sewed leather Case with shoulder strap . . . . . each $ 36 00

5375 L. Leveling Attachment with slow-motion screw similar to No. 5714 (page 436.) . . . . . each 3 50

The Stadia Hand Transit gives more accurate results than any similar portable instrument, and gives them in less time. In measuring vertical angles, the sighted object and the two scale readings (slopes and degrees) appear together in the field of view (see cut). Compass bearings can be sighted by the telescope on level ground or by the folding sights on sloping ground.

The Stadia Hand Transit is thoroughly well made and will meet the requirements of engineers and others who are engaged on preliminary work or on the subdivision of larger surveys made with a regular transit.

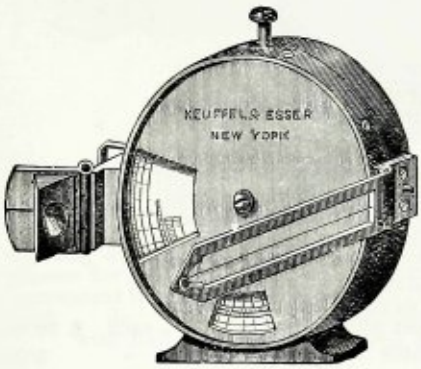
The instrument is threaded to be mounted with the compass box horizontal for using the compass or vertical for using the clinometer, as shown in cut.

The Leveling attachment adds considerably to the accuracy of the Stadia Hand Transit, especially when sighting at long range.

For Flexible (Pocket) Leveling Rods see page 463.

PRISMATIC COMPASSES.

Prismatic Compasses permit of observing the magnetic azimuth of objects not in the plane of the observer and are more accurate than others (except the regular Surveyor's Compasses) because through the prism the vertical hair of the sight-vane appears directly continuous with one of the divisions. The object, by means of the hair of the sight-vane is vertically projected to the plane of observation, so that angles are observed in one plane, like they are laid down on a map. Their accuracy can be increased by repeating the observations and taking their mean, or by backsighting.



"Copyright, 1887, by Keuffel & Esser."



as Clinometer. No. 5400. as Compass.

5400. Prismatic Compass, Clinometer and Altimeter, bronzed case. Compass dial 2¾ in. diameter, graduated to half-degrees, jeweled centre, automatic stop and spring check. Hinged sight vane with vertical wire. Gravity Clinometer and Altimeter formed by accurately balanced, sensitive, weighted disc 2¾ in. diameter, with stop and spring check, giving angles of elevation or depression in half-degrees and slopes in inches per yard. The inclination is read under the hair line on the cover glass. The compass is read by the lens-front prism which is adjustable for focus. Fiducial edge for clinometer. Socket for mounting on staff. With Directions . . . . . each $23 00

5400M. Prismatic Compass, Clinometer and Altimeter, like No. 5400, but clinometer giving slopes in centimeters per meter . . each $ 23 00

5405. Prismatic Compass, Clinometer and Altimeter, like No. 5400. The openings in the cover are much larger than in No. 5400, and the (lower) compass card is white to make the divisions better legible in dim light. With Directions . . . . . each $23 00

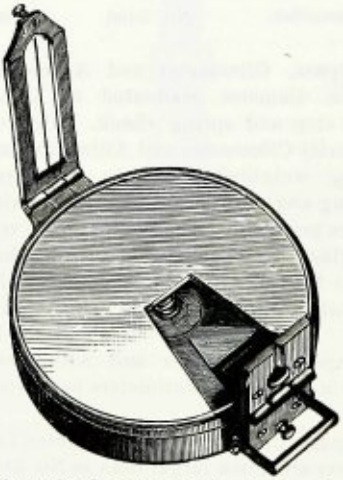
5405S. Sewed Leather Sling Case for Nos. 5400, 5400M or 5405 . " 3 00



No. 5408.

5408. Prismatic Compass, Clinometer and Altimeter, bronzed hunting case. Compass dial 2½ in. diameter, graduated to degrees, jeweled centre, automatic stop, spring check. In the hinged cover is a circular glass with sighting line. Clinometer and Altimeter formed by accurately balanced weighted disc 2½ in. diameter, graduated to degrees and for slopes in inches per yard. In leather Sling Case . . . . . each $ 30 00

5408B. Ball joint and socket for No. 5408 . . . . . " 3 50

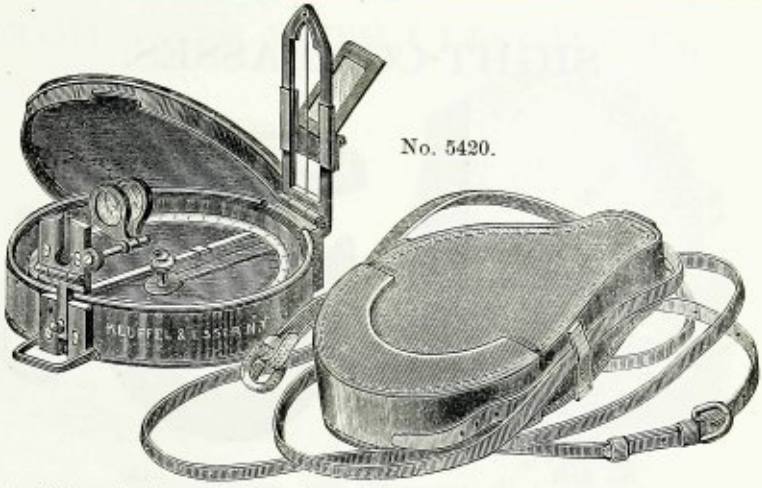


No. 5410.

5410. Hutchinson's Prismatic Compass, 2 in., bronzed, of improved pattern, nearly enclosed top, floating card dial graduated to half-degrees, jeweled centre, automatic stop and spring check, sight vane with vertical wire, in Case, with Directions . . . . . each $ 11 00

5411. do. do. do. 3 in., in leather Sling Case . . " 16 00

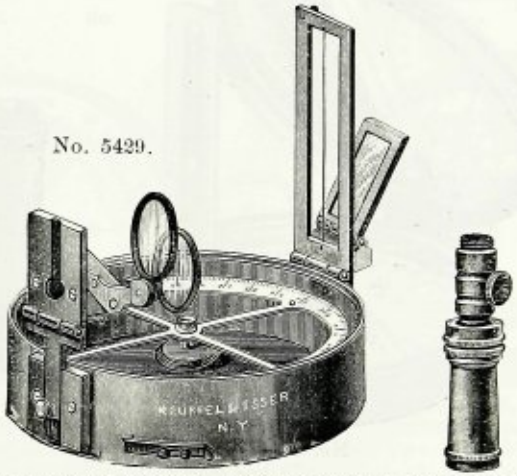
"Copyright, 1887, by Keuffel & Esser."



No. 5420.

5420. Prismatic Compass, 3 in., floating aluminum ring, graduated to half-degrees, jeweled centre, automatic stop and spring check, hinged sight vane with vertical wire and sliding mirror, which can be reversed to face upwards or downwards when sighting objects much above or below the horizontal plane, dark glasses for observing the sun's magnetic azimuth. Best quality instrument in leather Sling Case, with Directions . . . . . each $ 25 00

5422. do. do. with polished mahogany Tripod, cane pattern, with Ball joint and Socket, No. 5358, (page 421) . . . . . " 37 50



No. 5429.

5428. Prismatic Compass, 3 in., floating metal dial graduated to degrees, with stop, sightvane with vertical wire, plain Socket for Jacob staff, in mahogany Case, with Directions . . . each $ 12 85

5429. do. do. $3\frac{3}{4}$ in., floating metal dial graduated to half-degrees, neutral glasses for observing the sun, sight vane with vertical wire and attached hinged mirror, Ball joint and Socket for Jacob staff, in mahogany Case, with Directions . . . . " 21 50

Leather Sling Case in place of mahogany case . . . . . extra " 3 00

SIGHT-COMPASSES.



No. 5441.

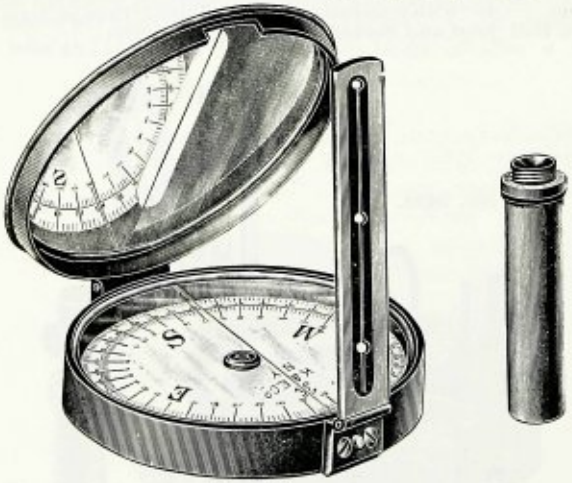


5450

5440. Bronzed Pocket Compass, 2½ in., **with cover**, folding sights, edge-bar needle with stop, each $ 5 25

5441 do. do. do. do. 3 in. " 6 25

5450. Pocket Compass, watch pattern, with folding sights, stop to needle, graduations on raised ring 1¾ 2 2⅜ in.
each $ 4 00 4 60 5 10



No. 5455.

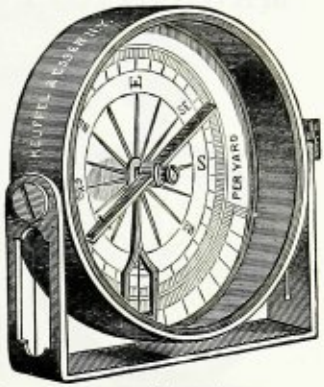
5455. Compass with Mirror in lid, floating card dial about 3½ in., jeweled centre, automatic stop, graduated to 2 degrees, numbered to 360. A second (inner) row of reversed figures, in quadrants, for reading in the mirror in the lid. One folding peep sight. The hair-line on the cover glass of the compass is continued across an unsilvered strip of the mirror, where it forms the sighting vane. Socket for staff head . . . . . each $22 00

COMPASSES WITH CLINOMETER.

"Copyright, 1887, by Keuffel & Esser"



as Sight Compass.

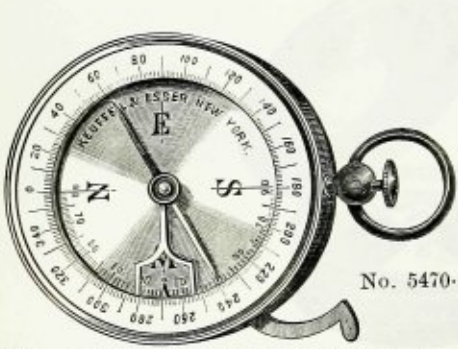


No. 5460. as Clinometer.

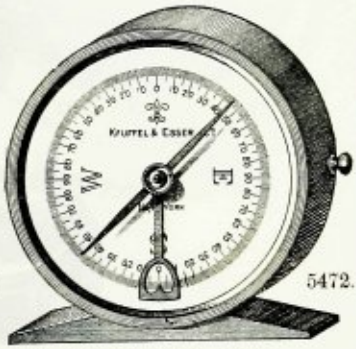
5460. Bronzed Sight Compass and Clinometer, 2½ in. diameter, graduated to degrees, bar-needle with stop. The sights are connected by a bar across the top, which when turned down serves as fiducial edge for the clinometer. The clinometer is graduated to give slopes in inches per yard and in degrees. This is a very practical instrument for taking angles, bearings, slopes, altitudes, etc Its lightness and small size add to its usefulness. In polished mahogany Case . . . . . each $ 7 25

5461. do. do. do. do. 3 in. diameter " 8 75

5462. do. do. do. do. 4 " " " 10 50



No. 5470.



5472.

5470. Pocket Compass and Clinometer, 2½ in., nickelplated, bar-needle 1¾ in. with jeweled cap and stop, graduated on raised ring to 2 degrees, shifting clinometer foot . . . . . each $ 4 30

5472. Harvard Geological Compass and Clinometer . . . . . " 4 00

5472S. Leather Case for No. 5472 . . . . . " 60

This Geological Compass was devised by the Harvard Geological Department and has given excellent satisfaction. It is of brass, bronzed; measures 2 inches in diameter by ⅛ inch thick, and has a solid base. The dial is silvered and is divided to degrees, numbered in quadrants. The needle is of approved pattern, with jeweled centre and stop. The pendulum clinometer is very sensitive and can be read closely. The instrument weighs about 3½ ounces.

This Compass is devised by a Geologist for Geologists, and is better adapted for its particular purpose than any other compass.

MAGNETIC POCKET COMPASSES.

No. 5490.



"Copyright, 1887, by Keuffel & Esser."

5493.



5490. Fine Watch-pattern Compass, nickelplated hunting case, edge-bar needle, with stop, metal dial, 1½ in., each $ 2 95

5491.	do.	do.	do.	do.	$1\frac{3}{4}$	"	"	3 20
5492.	do.	do.	do.	Singer's card dial,	$1\frac{1}{2}$	"	"	2 35
5493.	do.	do.	do.	" " "	$1\frac{3}{4}$	"	"	2 65
5494.	do.	do.	do.	" pearl "	$1\frac{3}{4}$	"	"	3 85

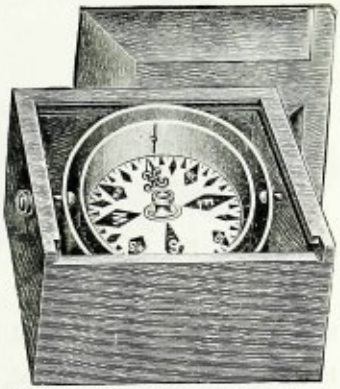
No. 5502.



5502. Night Pocket Compass, bronzed case 2¼ in., hinged cover, needle with very large luminous lettered points, jeweled centre, stop to needle, luminous compass ring graduated to 5 degrees, luminous index arrow to sight vane, compass ring revolves by milled-edge bezel, fixed index to line of sight, circular glass with sight vane (hair line) in the cover, peep sight in pendant . . . . . each $ 11 00

A very useful compass for military men, tourists, etc. The graduations, needle and index arrow are plainly visible by night.

BOAT COMPASSES.



No. 5495.

K & E Dry Compasses, flat card dial, jeweled centre, brass bowl hung in gimbals, in slide-lid box.

| | | |

POCKET COMPASSES.



No. 5550.



5556.



5585.

5550. Pocket Compass, brass, watch pattern, paper dial $1\frac{1}{4}$ $1\frac{3}{8}$ $1\frac{1}{2}$ in.
each $ 20 25 30

5556. do. brass, watch pattern, metal dial, stop to needle, $1\frac{3}{8}$ $1\frac{1}{4}$ in.
each $ 55 65

5575. do. brass, pull-off cover, paper dial $1\frac{1}{4}$ $1\frac{3}{8}$ $1\frac{1}{2}$ in
each $ 25 30 35

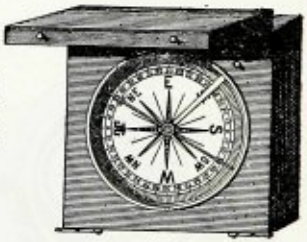
5585. do. brass, pull-off cover, metal dial, stop to needle, $1\frac{3}{8}$ $1\frac{1}{4}$ in.
each $ 85 95



No. 5591.



5593.



5599.

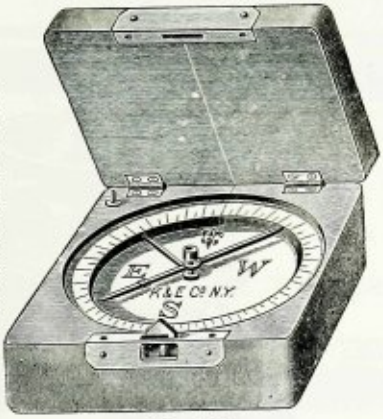
5591. Pocket Compass, heavy brass waterproof case, pull-off cover, metal dial, graduated on raised ring to 2 degrees, edge-bar needle with jeweled centre and stop, 2 $2\frac{3}{4}$ in.
each $ 1 85 2 00

5593 do. bronzed brass, pull-off cover, enameled card dial graduated to 2 degrees, edge-bar needle with jeweled centre and stop 2 $2\frac{3}{4}$ in.
each $ 1 25 1 50

5594. do. bronzed brass, pull-off cover, metal dial, graduated to 2 degrees, edge-bar needle with jeweled centre and stop $1\frac{3}{8}$ $2\frac{3}{4}$ in.
each $ 1 50 1 75

5599. do. square mahogany case with hinged cover, metal dial graduated to 2 degrees, edge-bar needle with jeweled centre, automatic stop, 3 in . . . . . each $ 2 50

SPECIAL POCKET COMPASSES.



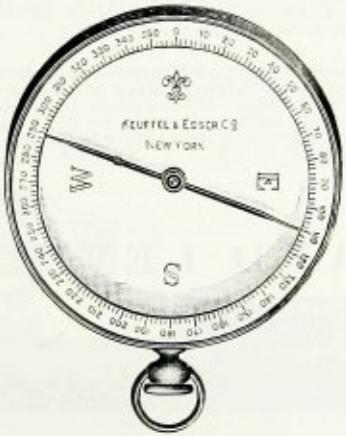
No. 5602.

5602. Military Compass, 3×3 in., needle 2 in. with jeweled centre automatic stop, graduated on raised metal ring to degrees numbered 0—360. Polished mahogany box with sighting line on lid . . . . . each $ 3 50

5602 X. Military Compass, like No. 5602, but graduations numbered in quadrants . . . . . " 3 50

5602½. Military Compass, like No 5602, but 3¾×3¾ in., needle 2½ in., graduations numbered 0—360 . . . . . " 4 50

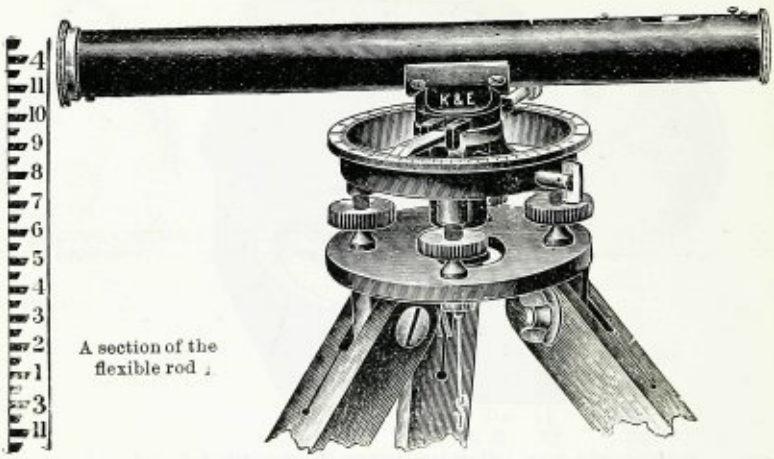
5602½X. Military Compass, like No. 5602½, but graduations numbered in quadrants . . . . . " 4 50



No. 5603.

5603. Forester's Compass, 3 in., nickelplated, graduated on raised ring to 2 degrees, fine bar-needle about 2⅜ in., jeweled centre, stop to needle (from pendant) . . . each $ 4 50

FARM LEVELS.



A section of the flexible rod.

No. 5690.

5690. **Farm Level,** Sighting Tube 10 in., pinhole eyepiece, plain glass front, with spirit level and cross-hairs, 4 in. horizontal circle graduated to degrees. Instrument complete, in wooden Box with lock-hooks and metal handle, Plumbbob, 6-foot flexible Leveling Rod and hardwood Tripod, with Directions, $ 16 00

5692. do. do. like No. 5690, but with Telescope, 10 in., with good lenses, object glass 1 in., shows objects erect. Complete with Plumbbob, 6-foot flexible Leveling Rod and hardwood Tripod, with Directions 25 00

The Farm Level is designed for laying out farm lands, draining, ditching, road-making and similar uses which do not require the accuracy of an Engineer's Level nor involve the determining of magnetic bearings. It has a graduated circle for reading horizontal angles with which a reasonably accurate line can be run. Full description and plain directions, free from technical terms, written expressly for those who are not surveyors, are furnished with each level.

HAND LEVELS.



Copyright, 1890, by Keuffel & Esser Co.

No. 5700.

5700. Locke's Hand Level, German silver, 5 in., in Case . . . . each $ 8 00
5701. do. Bronzed, 5 " " " . . . . " 7 00
5702. do. Brass, plain, 5 " " " . . . . " 5 00

Nos. 5700-5701 have magnifying lens for the bubble at the eye-end of the tube telescope.



Diagram, showing bubble in field of view



Patented "Copyright, 1894, by Keuffel & Esser Co." No. 5703.

5703. K & E Patent Hand Level, square tube, bronzed, 5 in., in Case, each $ 4 50
5704. do. do. " " nickelplated, " " 4 50

In Nos. 5703 and 5704 the reflector is a narrow prismoid, crossing the middle of the field of view, so that the field appears on both sides of the reflected bubble, as shown in above diagram. As the lower surface of the tube is flat and parallel with the bubble, these hand levels can be used also as contact level.

The Hand Level is a great help in chaining accurately and quickly.

STADIA HAND LEVEL (Telescopic).



5706. Stadia Hand Level, telescope 10 in., stadia hairs, object-glass 1 in., with Ball joint and Socket, in Leather Sling Case, each $18 00

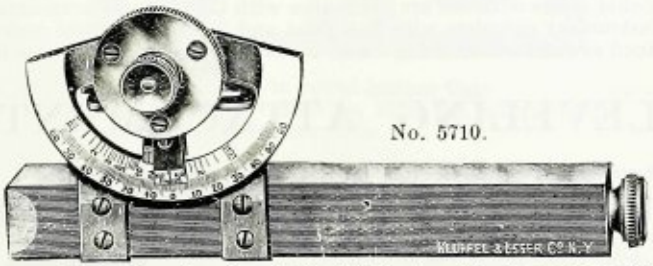
5707. Leveling Attachment for No. 5706, similar to No. 5714 (described on page 436) . . . . . " 3 50

The Stadia Hand Level has an achromatic erecting 10-inch telescope with 1-inch objective. The objective is drawn out for focusing and the eyepiece is adjustable for defining the stadia hairs, which read 1:100. This instrument will be found very useful for preliminary surveys, cross-sectioning, railroad construction work, exploration of streams for water power, etc. When set on a staff or tripod, a fairly accurate line of levels can be run. It is easily carried, as it weighs scant 1½ pounds. In connection with a flexible leveling rod it constitutes a good outfit for preliminary work, on account of its light weight and ease of manipulation.

For Stadia Hand Transit, see page 424.
For Flexible Leveling Rods see page 463.

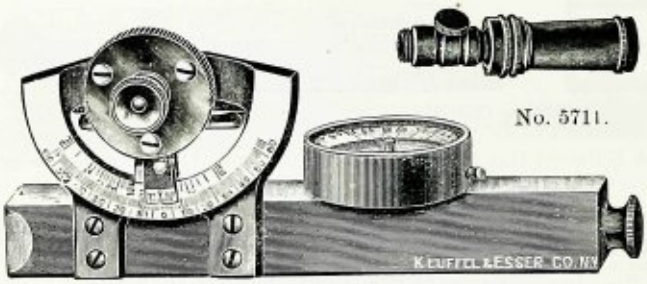
ABNEY LEVELS.

"Copyright, 1895, by Keuffel & Esser Co."



No. 5710.

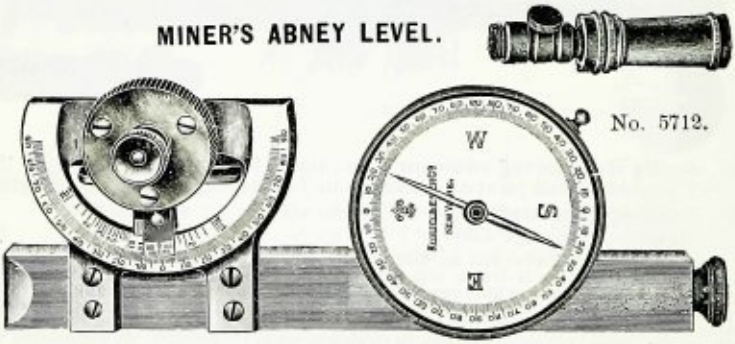
5710. Abney Reflecting Level or Pocket Altimeter, 5 in., improved, with arc graduated to degrees for 60°, vernier reading to 10 minutes, gradients 1:1 to 1:10 in both directions, in mahogany Case . . each $ 13 50
Sewed leather Sling Case, in place of mahogany case, . . . extra 1 40



No. 5711.

5711. Abney Reflecting Level or Pocket Altimeter, 5 in., arc graduated like in No 5710, bar-needle Compass 1⅜ in., Ball joint and Socket for Jacob Staff, in mahogany Case . . . . . each $ 18 00
Sewed leather Sling Case, in place of mahogany case, . . extra 1 90

MINER'S ABNEY LEVEL.

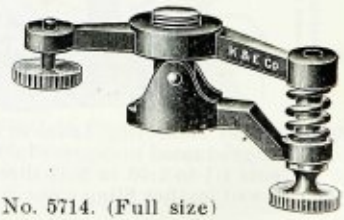


No. 5712.

5712. K & E Abney Level, for Mining, 6 in., arc graduated to degrees for 90°, vernier reading to 10 minutes; gradients from 1:1 to 1:10 in both directions. Base of tube is finished so that the instrument can be used also as contact level. Compass 2 in., silvered dial graduated to degrees, needle about 1⅝ in., jeweled centre, and stop. Two screw threads, so that level can be mounted on the socket either with the arc vertical or with the compass horizontal. Instrument complete with Ball joint and Socket, in stout velvet lined sewed Leather Sling Case . . . . . each $20 00

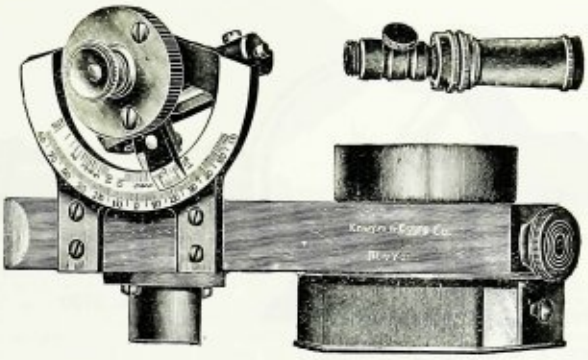
LEVELING ATTACHMENT.

5714. Leveling Attachment (for Abney Levels, etc.) bronzed brass, in leather Case; it adds to the accuracy of the instrument . . . . . each $ 3 00



No. 5714. (Full size)

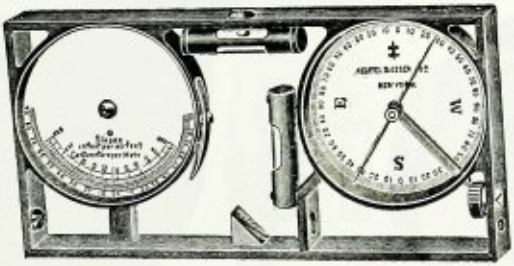
RECONNOISSANCE LEVEL.



No. 5715

5715. Reconnoissance Level, 5 in. This is an Abney level with $1\frac{3}{8}$-in. compass, similar to No. 5711, in combination with Penta-Prism Range Finder No. 5745. (see page 439). As it is a Universal Instrument giving bearing, grade and distance, it is very useful for reconnoissance and preliminary surveying. It is recommended also for use by military officers. Instrument with Ball joint and Socket for Jacob staff, in sewed velvet-lined Leather Sling Case, with Directions for the range finder . . . . . each $ 34 00

K & E POCKET OMNIMETERS.

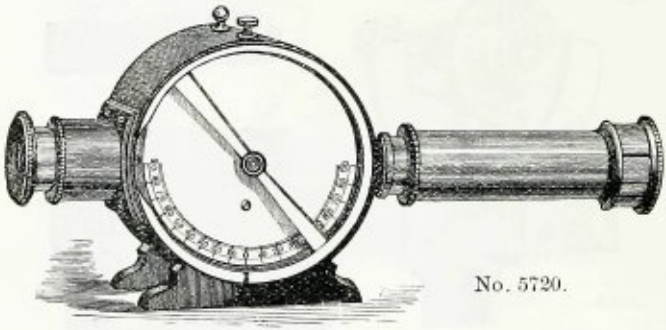


No. 5718

5718 K & E Pocket Omnimeter, in sewed leather Case . . . . . each $15 00
5719 " " " like No. 5718, but with folding Sights, in sewed leather Case . . . . . " 18 00

The K & E Pocket Omnimeter combines compass, clinometer, hand level, plumb, alidade, and contact level; it will indicate magnetic bearings, azimuth angles, altitudes, levels and slopes. The Omnimeter No. 5719 with folding sights indicates also azimuth angles of objects not in the horizontal plane. The rectangular frame of aluminum alloy, $5\frac{1}{4}$x$2\frac{5}{16}$x$\frac{1}{2}$ in., weighs about 5 ounces and serves also as fiducial edge. Compass 2 in. diameter, graduated to 2 degrees, numbered in quadrants at every 10 degrees, needle with jeweled centre and stop. Gravity Clinometer 2 in. diameter, graduated to 2 degrees and to slopes in feet per 100 feet horizontal or centimeters per meter. The prism of the hand level is attached to one of the long sides and its spirit level is on the opposite side of the frame. The spirit level is as sensitive as is admissible in a hand level.

POCKET ALT-AZIMUTH.

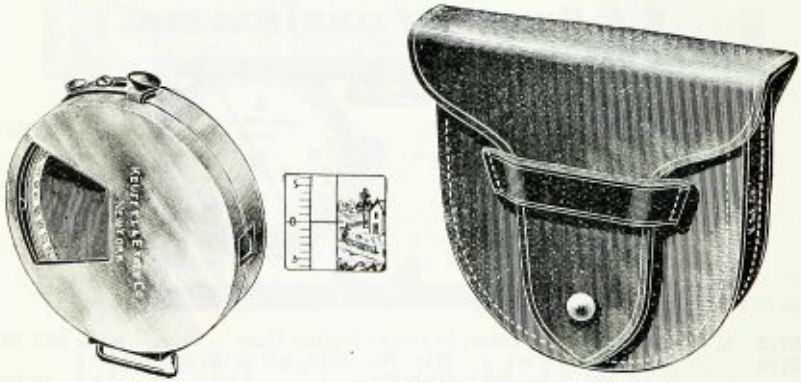


No. 5720.

5720. Pocket Alt-Azimuth, in morocco Case, ... each $ 50 00

The compass has jeweled centre, with stop and spring check. The weighted clinometer disc is accurately balanced and very sensitive, with stop and spring check. Compass and clinometer are both graduated to degrees and graduated and numbered also on their periphery. They are there read through the eye-piece of the telescope, which is adjustable and provided with cross-hairs. The telescope is focused by extending its tube and has an extra cap with colored glass to modify excessive light. The instrument has a fiducial edge for using it as clinometer. It measures $6\frac{1}{4} \times 2\frac{1}{2} \times 1\frac{1}{4}$ inches, and weighs about 13 ounces. It is so well made and practical that it is reliable for all observations within the scope of its size.

MILITARY CLINOMETER.



No. 5721.

5721. Military Clinometer as made by us for the U. S. Army. bronzed case $2\frac{3}{4}$ in. diam., sensitive weighted disc clinometer graduated 45° in both directions to single degrees, numbered at every 5 degrees, with automatic stop.

The scale reading and the sighted object are seen simultaneously (see cut).

The instrument has a fiducial edge (foot) for using it as contact clinometer and a wire loop for attaching a carrying strap. In sewed leather Case with belt loop, ... each $ 17 50

PENTA-PRISM RANGE FINDER.



No. 5745.

5745. Penta-Prism Range Finder, mounted in metal, in Leather Case, with Directions . . . . . each $ 10 00

No. 5745 is a pentagonal prism, (like No. 5765, page 441,) but the ocular side has two faces, of different angle, one of which is alternately exposed by shifting the sliding shutter. Distances up to over two miles can be determined from the point of observation with sufficient accuracy for many of the requirements of the surveyor or military officer. The mode of using it is extremely simple and very easily acquired with but little practice. Complete directions are furnished with the instrument. To obtain the distance sought, the base line, as determined by the prism, is measured and multiplied (mentally) by 50 (²⁰⁰). The angles of the prism are ground so accurately that no tables are required. Right angles are determined with this prism with great accuracy in the usual way

Tape for Measuring the Base Line.

No. 7482 Y. Best Metallic Tape, length 20 yards, graduated to read 1000 yards by single yards . . . . . each $ 4 00

This is a **K & E** Metallic Tape, 3/8 in. wide, stout bent leather case, large centre, folding handle, all mountings nickelplated, line interwoven with metal, end re-enforced with leather. The line is 20 yards long and graduated on a scale of 1 : 50 to read direct up to 1000 yards by single yards.

The tape in its case measures about 3-5/8 x 5/8 in. and weighs about 9 oz. Its compactness and light weight make it convenient for carrying in the pocket.

ANGLE MIRRORS.

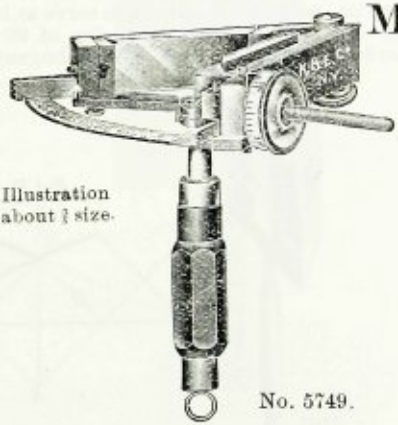


Illustration about ⅔ size.

No. 5749.

5749. Adjustable Folding Angle Mirror, arc graduated to degrees with Micrometer screw reading to minutes, folding ebony Handle, in velvet lined morocco Case, with Directions . . . . . each $ 15 00

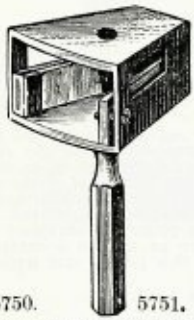
The advantage of this Angle Mirror is that the angle of the mirrors is not fixed, but adjustable. It is determined by an arc graduated from zero to 100 degrees, figured in accordance with the angle of the sighted point, being consequently double the angle of the mirrors. With this instrument offsets may be laid down at any angle up to 100 degrees from a given base, and distances to inaccessible points may be determined by a measured base and angle, when distance = base × tangent of angle. This computation for distance can also be worked out in a very simple manner by means of the slide rule.

This Angle Mirror will be found very useful, not only for the Surveyor and Civil Engineer, but also for the Military Officer, Traveler, etc.

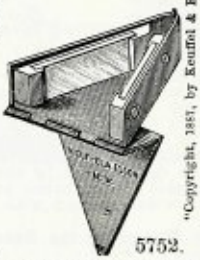
ANGLE MIRRORS AND PRISMS.



No. 5750.

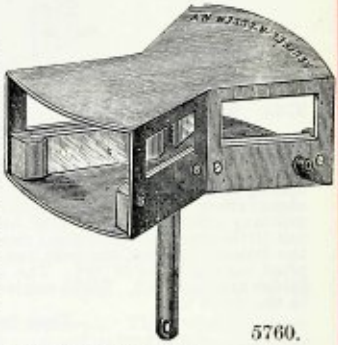


5751.



5752.

"Copyright, 1891, by Keuffel & Esser."



5760.

5750. Angle Mirror, for angles of 90 degrees, with small plumb bob. The handle can be unscrewed and stowed in frame of instrument. Size of instrument $2\frac{1}{4} \times 2 \times 1\frac{3}{4}$ in., in morocco Case . . . . . each $ 7 50

5751. Angle Mirror, plain, for angles of 90 degrees, in morocco Case . . . . . " 5 00

5752. Angle Mirror, for angles of 90 degrees, in brass casing $2\frac{1}{8} \times 2\frac{3}{8} \times \frac{3}{4}$ in., cover folding back to serve as handle . . " 6 00

5760. Double Angle Mirror, one side for angles of 90 degrees, the other for angles of 45 degrees, in mahogany Case . . " 10 00

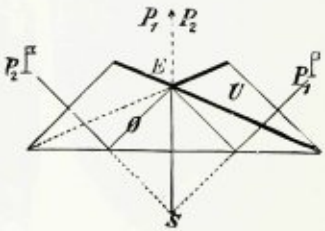
5761. do. do. for angles of 90 and 60 degrees . . . . . " 10 00



No. 5762.



5763.



5762. Rectangular Prism, for angles of 90 degrees, $2\frac{1}{2} \times 1\frac{1}{4} \times 1\frac{5}{8}$ in. in morocco Case . . . . . each $ 5 00

5763. Double Prism, for angles of 90° and 45°, in morocco Case " 10 00

This neat and simple instrument consists of two prisms of $22\frac{1}{2} \times 45 \times 112\frac{1}{2}$°, placed one above the other in brass mounting, to the handle of which a plumb line can be attached. The longer sides of the prisms are placed in one plane, facing the observer, and the reflecting surfaces cross each other at E. When one prism is used alone, an angle of 45° can be set off. By using both prisms, the observer will see the object P_2 in the upper prism to the right and object P_1 in the lower prism to the left. When the position is shifted, so that the two objects are seen one vertically above the other, the observer is in the apex of the right angle, between the two objects.

This instrument is very useful in cross-sectioning and dividing up land, also for laying out building-ground.

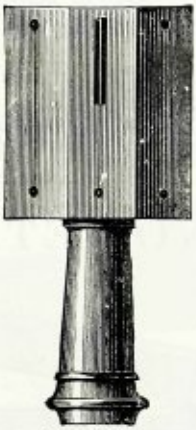


No. 5765.

5765. Pentagonal Prism, for angles of 90 degrees, with detachable Handle, in morocco Case . . . . . each $ 8 50

Of the five faces of the prism two are polished and open. The longer two of the other faces are polished and silvered and covered by the casing. The fifth (short) face has no optical function. By this novel optical construction the reflected immovable image is much more distinct and much better illuminated than in triangular prisms, while its size is about twice that produced by the latter. These pentagonal prisms are therefore far superior to triangular prisms of similar size and give more accurate results, with easier manipulation.

STAFF HEADS.



No. 5770.

5770. Cross Staff Head, octagonal, 2½ in., Socket for Jacob staff, in Case. . . . . each $ 2 75

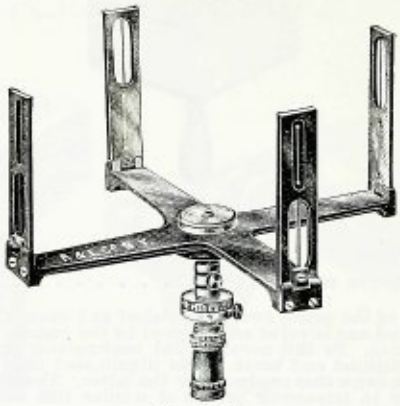
5772. do. do. 3 in., with magnetic Compass, graduated on raised ring to 2 degrees, needle about 1¾ in., in Case " 4 75

5775. do. do. revolving, with rack-movement, German silver rim graduated to degrees, with vernier reading to 2 minutes, Compass graduated to 2 degrees, needle about 2½ in. with jeweled centre and stop, in Case . . " 11 50

For Jacob Staff and Tripods see page 422.

SURVEYOR'S CROSSES

(STAFF HEADS.)



No. 5780.

5778. Surveyor's Cross, bronzed brass, 8 in., strong ribbed arms, folding fore and back-sights, circular spirit level 1¼ in., Socket for Jacob Staff, in wooden Box with hooks . . . . . each $ 7 00

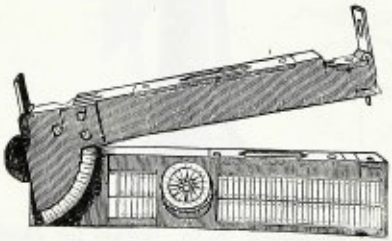
5779. Surveyor's Cross, like No. 5778, but with Ball joint and Socket . . . . . " 9 00

5780. Surveyor's Cross, like No. 5779, but socket with silvered ring graduated to 5 degrees . . . . . " 11 00

The Surveyor's Cross is an improvement over the staff head, as its greater size makes it more accurate. For some kinds of work it is preferable to more elaborate instruments on account of ease of manipulation.

It is used chiefly by Builders, Landscape Gardeners, Farmers, etc.

CLINOMETERS.

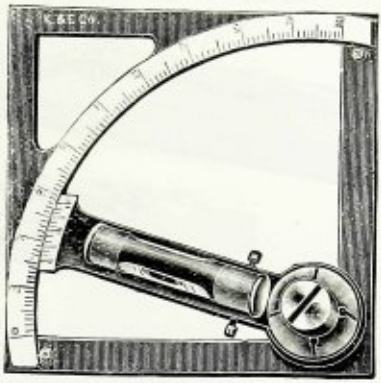


No. 5801.

5800. Boxwood Clinometer, 12 in., folding to 6 in., brass mountings, with 2 spirit levels, compass and inclination scale, in leather Pocket Case . . . . . each $ 9 20

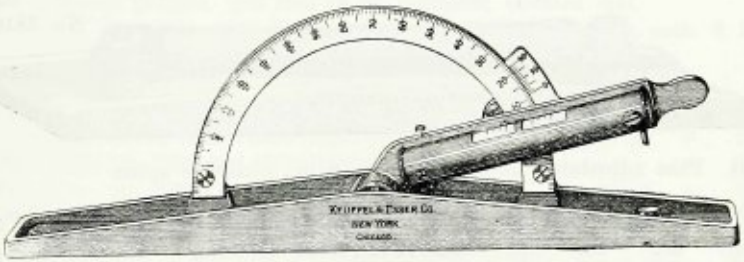
5801. do. do. do. with folding sights, in leather Pocket Case " 12 40

The inclination scale on these clinometers gives the value of any angle, as follows: The angle ascertained from the divided arc upon the instrument, refers to that degree in the column marked **angle**, and opposite in another column will be found the rise or fall in any given measured distance. For instance, the degree shown on the divided arc is 18, opposite this number, on the scale, is 3, thus indicating one part fall or rise in three, or 1 mile in 3 miles, 1 foot in 3 feet, etc.



No. 5805.

5805. Clinometer or Slope Level, bronzed, square frame 4 in., with silvered arc graduated to degrees, vernier reading to 5 minutes, fine adjustable spirit level graduated on the glass, in Case . . . . . each $ 10 00

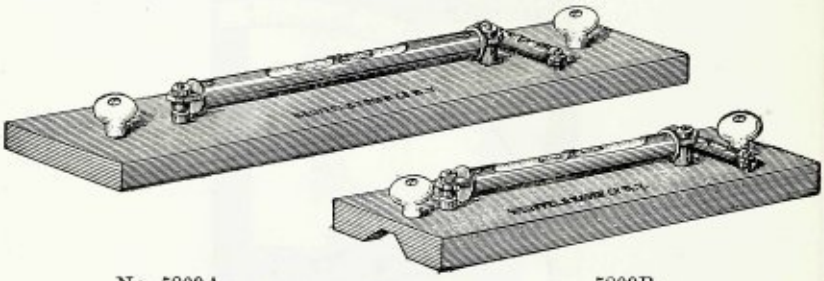


No. 5808.

5808. Combined Level and Clinometer, bronzed, base 9 in., silvered arc 4½ in. diameter, graduated to degrees, vernier reading to 5 minutes, fine adjustable spirit level graduated on the glass, arm with clamp-screw, in mahogany Case . . . . . each $ 12 00

This is a very practical level for Civil Engineers, Architects, Machinists, Builders and others. It can be applied direct in mounting machinery, construction material etc. or it can be used on a straightedge to determine the slope of ground, embankments or excavations, in laying rails and for other similar purposes.

LEVELS.



No. 5809A. 5809B.

5809 A.	Fine Adjustable Level, iron base 18 × 4 × 1 in. very sensitive spirit level 9 in., weight about 13 lb., ...	each	$ 20 00
5809 B.	do. do. 12×3×1 in., very sensitive spirit level 6 in., weight about 5 lb., grooved base	"	16 00
5809 C.	do. do. 12×3×1 in., very sensitive spirit level 6 in., weight about 6 lb., flat base. . . .	"	12 00

The levels No. 5809 are of the finest workmanship and of the greatest precision and very sensitive. The spirit levels are graduated on the glass and are adjustable. Each level is provided with a cross level for accurate adjustment. No 5809 B has a grooved (V-shape) base for use on round surfaces, such as shafting. We recommend these levels for the most particular and delicate work. The Levels are in fine **HARDWOOD CASE.**

"Copyright, 1894, by Keuffel & Esser Co."



No. 5810.

5810.	Fine adjustable Level, iron base 8 in., sensitive spirit level graduated on the glass, base with side braces to make it more rigid, level vial 3½ in., . . in Case,	each	$ 6 50
5811.	do. do. do. base 12 in., level vial 6 in.,	"	"	8 00
5812.	do. do. do. " 16 " " " 7 "	"	"	10 00

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No. 5816

5815.	Adjustable Level, brass, spirit level graduated on the glass, base 6 in., spirit level tube 4 in., in Case . .	each	$ 2 00
5816.	do. do. 8 " " " " 6 " "	"	3 00
5817.	do. do. 10 " " " " 8 " "	"	3 50
5818.	do. do. 12 " " " " 10 " "	"	3 75
5819.	do. do. 14 " " " " 12 " "	"	4 25

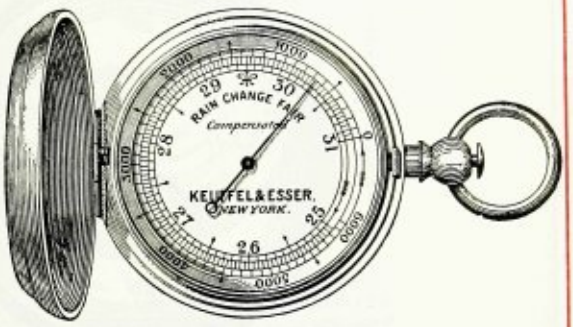
ANEROID BAROMETERS

FOR MEASURING ALTITUDE AND ATMOSPHERIC PRESSURE.

"Copyright, 1894, by Keuffel & Esser Co."

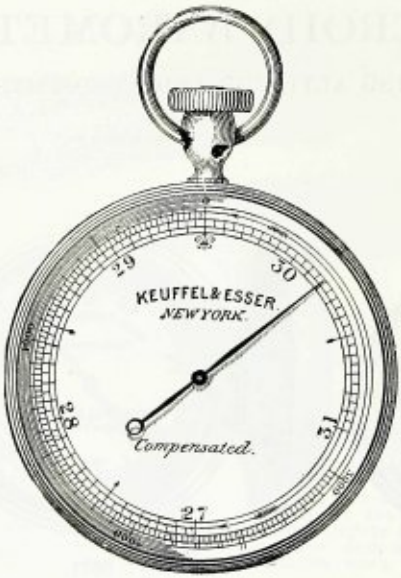


No. 5855.



5871.

5850.	Watch pattern, gilt case $1\frac{3}{4}$ in. diameter, silvered dial, revolving altitude scale 8000 feet, in morocco Case, each	$ 12 90
5855.	Watch pattern, gilt case $1\frac{3}{4}$ in. diameter, silvered dial, revolving scale 3000 feet, compensated for temperature, in morocco Case	" 20 00
5856.	Like No. 5855, but altitude scale 6000 feet	" 18 80
5857.	" " 5855, " " " 12000 "	" 20 00
5858.	" " 5855, " " " 18000 "	" 21 50
5860.	Pocket pattern, gilt case $1\frac{3}{4}$ in. diameter, silvered dial, revolving altitude scale 8000 feet, compensated for temperature, detachable bar-needle compass on reverse side, in morocco Case	" 29 50
5861.	Like No. 5860, but altitude scale 18000 feet	" 30 60
5870.	Watch pattern, nickel hunting case 2 in. diameter, silvered dial, revolving altitude scale 3000 feet, compensated for temperature	" 23 20
5871.	Like No. 5870, but altitude scale 6000 feet	" 22 00
5872.	" " 5870, " " " 12000 "	" 23 20
5873.	" " 5870, " " " 18000 "	" 25 25

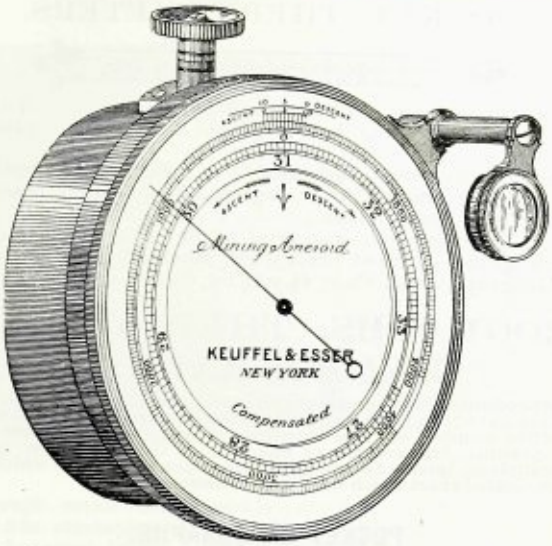


No. 5890

5880.	Pocket pattern, brass case 2½ in. diameter, silvered dial, revolving altitude scale 3000 feet, compensated for temperature, in morocco Case	each	$ 21 00
5881.	Like No. 5880, but altitude scale 6000 feet	"	21 00
5882.	" " 5880, " " " 12000 "	"	21 00
5883.	" " 5880, " " " 18000 "	"	22 00
5890.	Pocket pattern, bronzed case 2¾ in. diameter, silvered dial, revolving altitude scale 3000 feet, operated by rack and pinion, revolving pointer (index) operated separately by milled ring, compensated for temperature, in sewed leather Sling Case	"	33 30
5891.	Like No. 5890, but altitude scale 6000 feet	"	32 20
5892.	" " 5890, " " " 12000 "	"	33 30
5893.	" " 5890, " " " 18000 "	"	34 65

As the altitude scale and the pointer of Nos. 5890 to 5893 have separate actions, these instruments can also be used as with fixed altitude scale.

5895.	**Mining Barometer**, like No. 5890, but reading 2000 feet below and 6000 feet above sea level	each	$ 34 65



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No. 5920

5900.	English Government pattern, brass case 5 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 6000 feet, revolving pointer, compensated for temperature, curved thermometer, in morocco Case,	each	$ 32 20
5902.	Like No. 5900, but altitude scale 12000 feet	"	35 45
5904.	5900, " " " 18000 "	"	38 10
5910.	Surveying Barometer bronzed case 3 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 14800 feet, vernier scale operated by rack and pinion, reading to 5 feet, compensated for temperature, adjustable reading lens, in leather Sling Case	"	50 50
5915.	Surveying Barometer, bronzed case 5 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 5000 feet, vernier scale operated by rack and pinion reading to 1 foot, compensated for temperature, adjustable reading lens, in leather Sling Case	"	58 00
5916.	Like No. 5915, but altitude scale 14900 feet	"	75 00
5920.	Mining Barometer, bronzed case 5 in. diameter, silvered dial, graduations on raised ring, fixed altitude scale 2000 feet below and 4000 feet above sea level, vernier scale operated by rack and pinion reading to 1 foot, compensated for temperature, adjustable reading lens, in leather Sling Case	"	58 00

The instruments Nos. 5910 to 5920 are constructed specially for ascertaining slight variations in gradients, levels etc. Their extreme sensitiveness is of great value in mining and surveying work generally. A valuable improvement in these instruments is an arrangement of the scale of altitude permitting the reading by vernier, formerly impracticable owing to the usual altitude scale being a gradually diminishing one, to which a vernier could not be applied. In the above instruments the action has been adjusted to give accurate readings upon a uniform scale of altitudes, the barometrical scale of inches having been made progressive so as to afford the correct relative readings with the scale of altitudes.

These instruments are also constructed for measuring greater altitudes, i. e., up to 20,000 feet, but with these higher scales the measurements cannot be made quite so minute as with the more open scales.

Manual: **The Aneroid Barometer, Its Construction and Use, 16 mo., boards $ 50**

POCKET THERMOMETERS.



No. 5930.

5930. Pocket Thermometers, mercurial, 5 in., Fahrenheit, opal glass scale reading to 2 degrees, nickelplated brass Case . . . . . each $ 85

5931. Pocket Thermometers, mercurial, 4 in., Fahrenheit, opal glass scale reading to 2 degrees, nickelplated brass Case with ring pendant . . . . . " 50

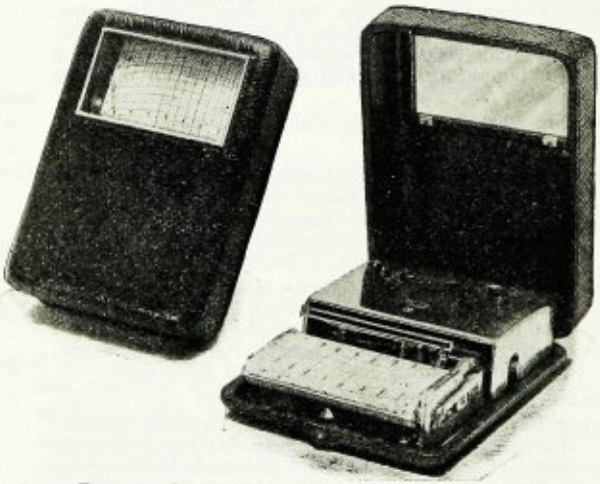
5932. Pocket Thermometers, mercurial, 4 in., Fahrenheit and Centigrade, oxidized brass scale, mounted in polished Mahogany Pocket Case, 4½ x 1¼ in., hinged cover . . . " 1 75

BAROGRAPHS, THERMOGRAPHS, HYGROGRAPHS.

These Self-recording instruments are for many purposes preferable to reading instruments. They have been perfected, so that they now are reliable and correct.

The sensitive member of these instruments expands or contracts under varying conditions of pressure, temperature, or humidity of the atmosphere and imparts its motion to a multiplying lever. To one end of this a pen is attached which automatically records on a graduated chart which travels by clockwork

POCKET BAROGRAPHS.



No. 5935.

5935. Pocket Barograph, compensated for temperature, reading to 4000 feet, in morocco covered metal Case, bottle of Ink and 50 graduated Charts, with Directions . . . . . each $ 60 00

5936. Like No. 5935, but reading to 7800 feet . . . . . " 55 00

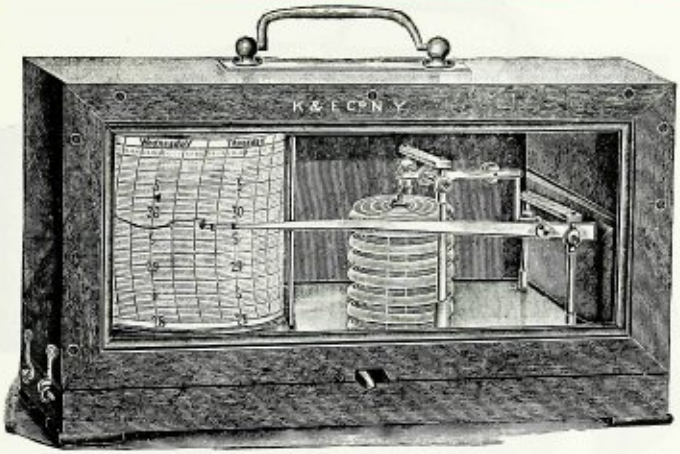
5937. " " " " " 15000 " . . . . . " 55 00

These self-recording aneroid barometers are of great advantage in many cases where the bulk and weight of the usual barographs forbid their use.

The Pocket Barograph measures 4¾ x 3¾ x 1¾ in. and weighs about one pound. The metal, morocco covered case has a glass inserted in the cover over the chart, for taking readings without opening the case.

The chart is so ruled that it represents the time by half-hours, for 24 hours and the pressure in feet of altitude. The pen makes contact every two minutes

Notwithstanding its small size the Pocket Barograph is a reliable instrument. It also indicates atmospheric changes, like other aneroids.

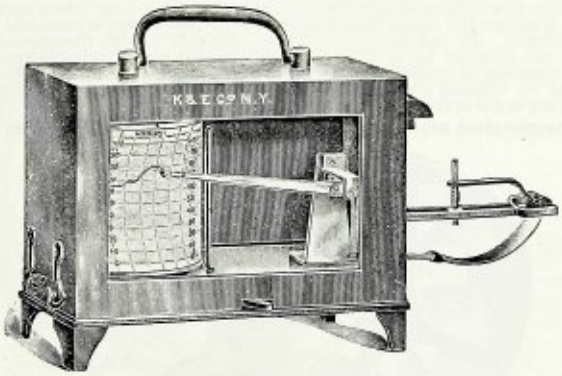


No. 5941.

5940. Barograph, small size; registering one week; from 28 in. to 30.5 in. atmospheric pressure by twentieths inches. Series of 5 vacuum boxes; cylinder $2\frac{5}{8}$ in. diameter by $2\frac{3}{4}$ in. high. In polished mahogany Case with handle, hinged cover with glass-paneled front. With Charts for one year, and bottle of Ink . . . . . each $ 40 00

5941. do. do. but large size; series of 8 vacuum boxes, cylinder $3\frac{5}{8}$ in. diameter by $3\frac{1}{2}$ in. high . . . . . " 55 00

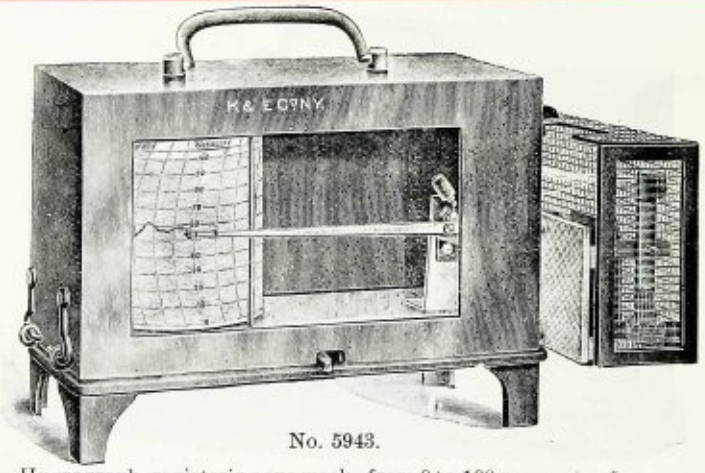
5941 H. Gimbal Hook for suspending Barograph from ceiling on shipboard . . . . . " 6 00



No. 5942.

5942 Thermograph, registering one week; from 0 to 100 degrees Fahrenheit by 2 degrees; cylinder $2\frac{5}{8}$ in. diameter by $2\frac{3}{4}$ in. high. In weatherproof metal case with handle and glass-paneled front. With Charts for one year and bottle of Ink . . . . . each $ 40 00

The curved tube outside of the case contains alcohol and is hermetically sealed. The alcohol expands and contracts under changes of temperature, thereby changing the curve of the tube, thus imparting motion to the recording lever.



No. 5943.

5943. Hygrograph, registering one week; from 0 to 100 per cent. of moisture by single per cent. Cylinder 3⅛ in. diameter by 3⅜ in. high. The sensitive hairs are protected by a wire cage. Instrument in weatherproof metal case with glass-paneled front and handle. With Charts for one year and bottle of Ink . . . . . each $ 60 00

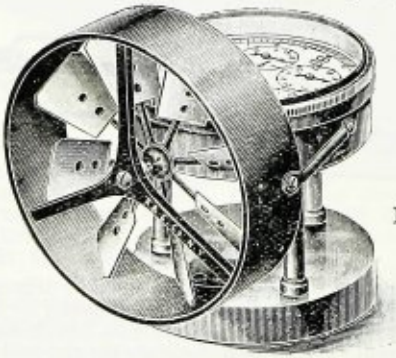
The sensitive member of this instrument consists of a bundle of fine hair, which expands and contracts under variations of humidity, which motion is imparted to the recording mechanism.

ANEMOMETERS.

Anemometers (Air Meters) are used for measuring the velocity of air currents in mines, sewers, public buildings, hospitals, tunnels, etc. They serve manifold and important sanitary and scientific purposes.

The fans (or vanes) must always face the current. The long hand registers feet on the large dial, while on the small dials hundreds, thousands, ten-thousands, etc., are successively registered. All our anemometers are provided with disconnector, which is thrown in or out of gear by a lever. In the Patent Self-Timing Anemometers (see page 452) the duration of registering is controlled automatically by clock work. The registered feet of velocity multiplied by the area of the air-passage in square feet give the volume of air in cubic feet.

These Anemometers are intended for Velocities up to 2,000 feet per minute.



No. 5952.

5950. Improved Portable Air Meter, with disconnector, vane 2½ in. diam., registering to 1000 feet, in polished mahogany Case . . . . . each $ 19 50

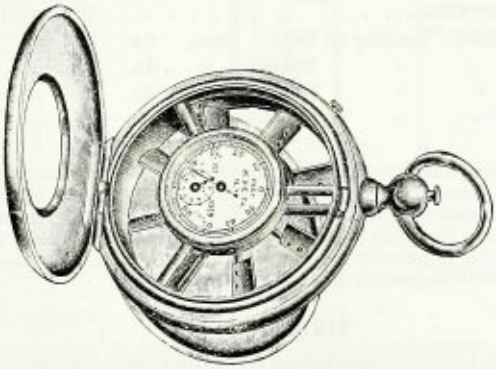
5952. do. do. do. registering to 10,000,000 feet, " 21 75



No. 5965.

5953. Biram Anemometer, 3 in. diam., reading to 1000 feet, with disconnector, in polished Mahogany Case . each $ 18 50

5957.	do.	4 in. diam., reading to 1000				feet,	do.	"	19 00
5958.	do.	4 "	"	"	" 100,000	"	do.	"	21 00
5963.	do.	6 "	"	"	" 1000	"	do.	"	21 00
5965.	do.	6 "	"	"	" 10,000,000	"	do.	"	30 00

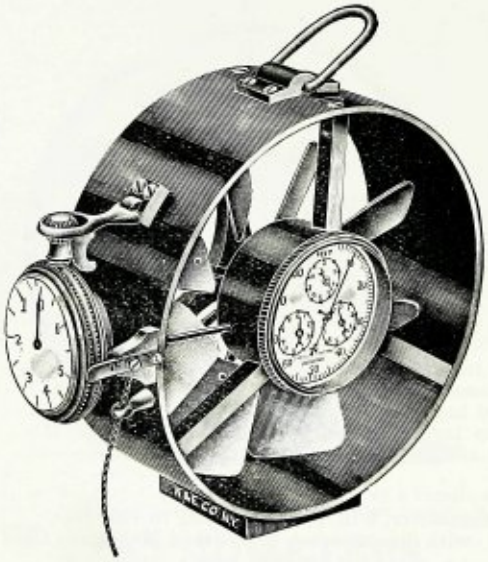


No 5968.

5968. Watch-pattern Anemometer, 2 in., registering to 1000 feet; nickel plated hunting case, with disconnector. The two covers, when open form a base for the instrument. In velvet lined morocco Case . . . . . each $ 30 00

SELF-TIMING ANEMOMETERS.

(Patented.)



No. 5958 T.

5953T.	Biram Anemometer, Self-timing, 3 in. diam., reading to 1000 feet, with disconnector, in polished mahogany Case							each	$ 33 50
5957 T.	do.	4 in. diam.,	reading to	1000	feet,	do.		"	34 00
5958 T.	do.	4 " "	"	" 100,000	"	do.		"	36 00
5963 T.	do.	6 " "	"	" 1000	"	do.		"	36 00
5965 T.	do.	6 " "	"	" 10,000,000	"	do.		"	45 00

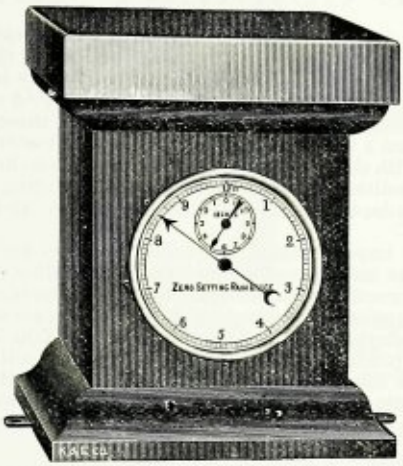
The self-timing anemometers are set to register by clock work, during a stated number of minutes up to six minutes (by half-minutes). After being placed in position they are started by means of a cord attached to the lever and they stop automatically when the set time has expired. They therefore register for a definite period of time, while in the old style of instruments the registering begins when the air current strikes the vanes and continues until the disconnecting lever is shifted by hand.

TESTING.

We have the best possible appliances for testing anemometers and furnish with each anemometer a table giving a number of comparisons. A much more complete table of this kind, covering the range of the instrument will be furnished to order. The price of such testing is according to the conditions of the test.

As we manufacture anemometers, we have the best facilities for repairing them, whether of our make or other

RAIN GAUGES.



No. 5971.

5971. Registering Rain Gauge, zero-setting, metal case $8\frac{1}{2} \times 8\frac{1}{2}$ in. $\times 10\frac{1}{4}$ in. high, records up to 12 inches of rainfall by 100ths inches. The copper receiver is of improved design . . . each $26 00



No. 5980 G. 5980. 5982 G. 5982. 5984. 5984 G.

5980. Rain Gauge, Howard's model, simple construction, with graduate reading to $\frac{1}{100}$ in., ... each $ 5 00

5982. do. Symon's model, with prongs to prevent tipping, with graduate reading to $\frac{1}{100}$ in., ... " 6 00

5984. do. Glaisher's model, a very reliable instrument, with graduate reading to $\frac{1}{100}$ in., ... " 8 50

Extra Graduates	No. 5980 G.	5982 G.	5984 G.
each	$ .75	.75	1 00

K & E CURRENT METERS.

The use of the Current Meter is becoming of increasing importance for technical and scientific purposes. The construction of these instruments, as offered by us, presents a considerable progress and many improvements.

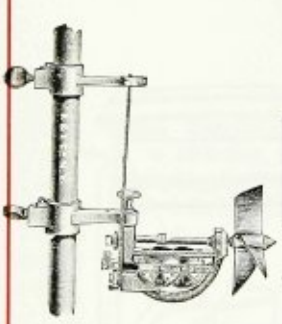
Current Meters are constructed either with graduated registering wheels or with electrical recording mechanism or with both these means of reading. They are mounted on a rod or are anchored (floating meters).

While meters with electrical recording device (Hasslacher's construction) can be used under all conditions, those with graduated recording wheels (Woltmann's construction) are adapted chiefly to shallow waters and medium and low velocities.

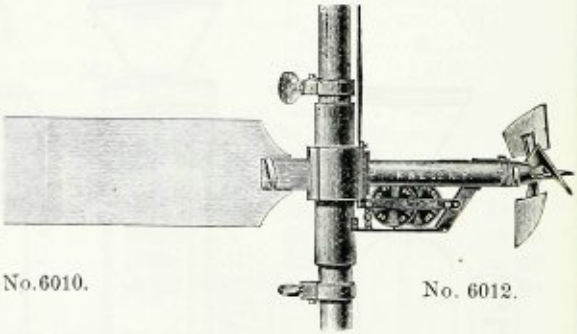
Of the various improvements we would mention the ball-bearings of the propeller axis. The balls are of a very hard nickel alloy and rust-proof. The ball-bearing in conjunction with the agate bearing of the pivot insures a hitherto unattained ease of motion. The wings of the propellers are on the plane of a true screwthread at a definite angle to the axis. The constant is therefore in a definite relation to the pitch, except at the very lowest velocities.

Current Meters should, whenever possible, be used attached to a rod, and should be used floating only when extreme depth or velocity make this mode of use necessary.

A. CURRENT METERS WITH REGISTERING WHEELS.



No. 6010.

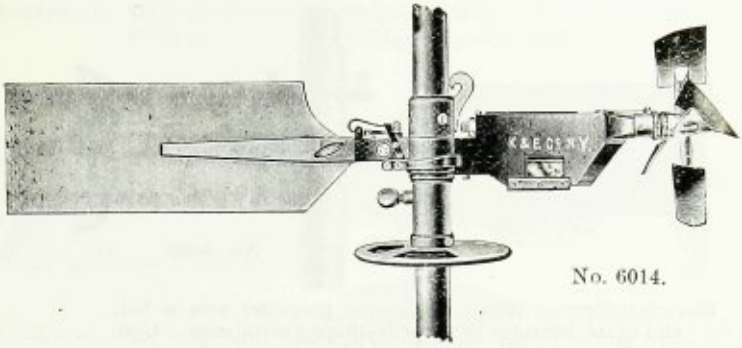


No. 6012.

6010. Current Meter, pocket size; two graduated wheels registering to 1000 revolutions. The registering wheels can be thrown into and held in gear by a string attached to a lever, or they can be released and stopped by means of a cam operated by two strings and attached to the frame. The instrument fits on a pole of $\frac{3}{4}$ in. diameter. It can be taken apart and stored compactly in a morocco Case 9 x 4 x $1\frac{1}{2}$ in. . . . . each $ 45 50

6012. Current Meter, medium size; propeller axis in ball and agate bearings encased in torpedo-shaped mantle; two graduated wheels registering to 1000 revolutions; improved arrangement for engaging and disengaging registering wheels; detachable metal rudder $3\frac{1}{2}$ x 9 in.; fits on a pole of 1 in. diameter. Two adjusting rings with clamp screw. Instrument in polished hardwood Case, " 78 00

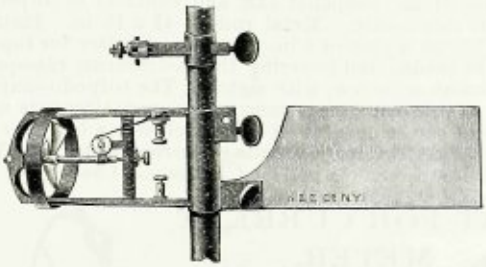
For Accessories see page 457.



No. 6014.

6014. Current Meter, large size; propeller axis in ball and agate bearings; two graduated wheels registering to 1000 revolutions; recording mechanism and axis enclosed in a metal case with glass panel; continuous engaging and disengaging mechanism to recording wheels (one pull on the lever engages, the next pull disengages the gearing and so on alternately). Metal rudder 4¼ x 12 in.; instrument fits on a pole of 1 in. diameter. Pulley for top of pole, with clamping device for raising and lowering instrument, sights for determining the direction of the instrument. Instrument in polished hardwood Case . . . . . each $ 125 00

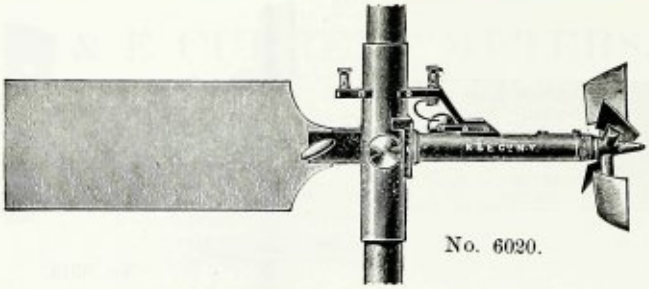
B. CURRENT METERS WITH ELECTRICAL RECORDING APPARATUS.



No. 6018.

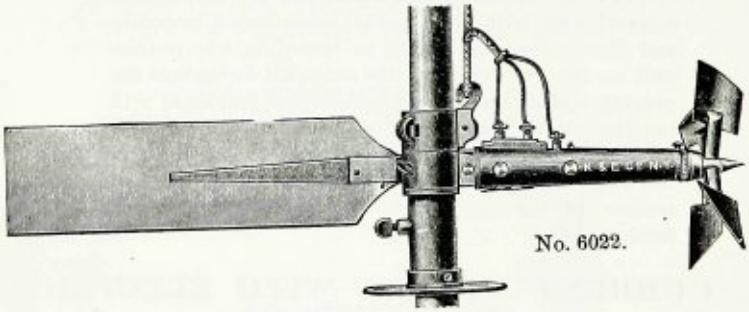
6018. Electric Current Meter, pocket size, propeller 2⅛ in. diam., propeller axis in agate bearings. Electrical contact for every 50 revolutions, metal rudder about 3 × 7 in. Instrument fits on a pole of ¾ in. diameter. In polished hardwood Case. . . . . each $ 37 50

For Accessories see page 457.



No. 6020.

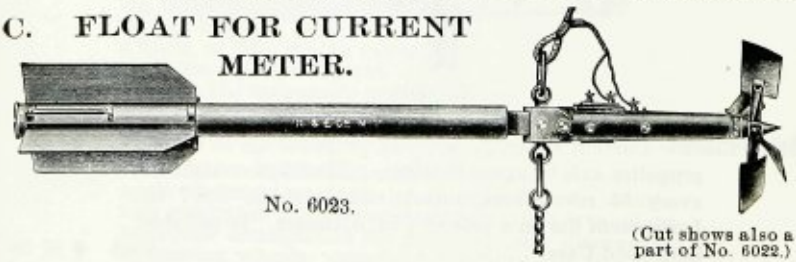
6020. Electrical Current Meter, small size; propeller axis in ball and agate bearings in torpedo-shaped metal case. Contact for every 25 revolutions. Metal rudder 3¾ x 9 in. Instrument fits on a pole of 1 in. diameter; two adjusting rings with clamp screws. In polished hardwood Case . . . . . each $ 65 00



No. 6022.

6022. Electrical Current Meter, medium size; propeller axis in ball and agate bearings, contact for single and for every 20 revolutions; propeller axis and contacts in torpedo-shaped metal case. Metal rudder 4⅜ x 12 in. Instrument fits on a pole of 1 in. diameter. Pulley for top of pole for raising and lowering the instrument; clamping sleeve with set screw, with sights. The torpedo-shaped body of this instrument carrying the propeller axis and contacts, can be unscrewed and attached to a large metal rudder, thus forming a Floating Current Meter (see No. 6023.) Instrument in polished hardwood Case . . . each $ 136 50

C. FLOAT FOR CURRENT METER.



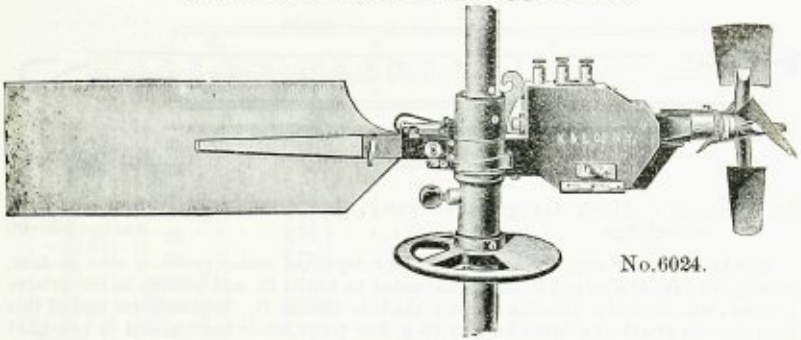
No. 6023.

(Cut shows also a part of No. 6022.)

6023. Brass Float with Rudder, with Hooks for suspending and anchoring, for Meter No. 6022, in hardwood Case . . each $ 40 00

For Accessories see next page.

D. Current Meter with Graduated Recording Wheels and Electrical Recording Apparatus.



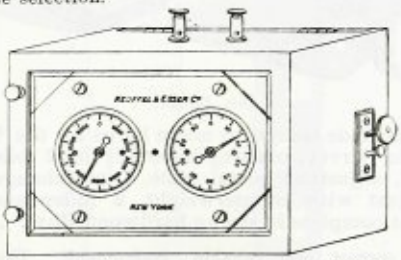
No. 6024.

6024. New Universal Current Meter; propeller axis in ball and agate bearings; two graduated gear wheels registering to 1000 revolutions, with a continuous engaging and disengaging mechanism (see No. 6014). Contacts for single and for every 25 revolutions; all gear wheels, propeller axis and contacts are in metal case with glass panel. Metal rudder 4½ x 12 in. Instrument fits on a pole of 1 in. diameter, with pulley and clamping arrangement, with sights. In polished hardwood Case . . each $ 170 00

ACCESSORIES FOR CURRENT METERS.

6028 A.	Iron Tubing, galvanized, not graduated	per foot	$ 20
6028 B.	Brass Tubing, seamless " "	"	50
6028 C.	Steel Tubing, " " "	"	35
6028 D.	Graduating any of above Tubing in feet and 10ths ft. . .	"	50
6028 E.	Guide-bar, attached to Tubing for Nos. 6014, 6022, 6024 .	"	1 50
6028 F.	Screw-joint (on tubing)	each	2 50
6028 G.	Steel point	"	1 00
6028 H.	Base-plate	"	75

These tubings are made to order only and can be furnished in any length up to 12 feet, plain or graduated. For convenience of carrying we also make them in sections with screw joints. The tubing for Current Meters No 6014, 6022 and 6023 can be provided with a guide-bar to prevent the instrument from revolving on the tube when raising and lowering it by means of the cable. The prices for tubings and their attachments are given separately to facilitate selection.



6028 L.

6028 L.	Electric Register, 2 dials registering up to 10000 revolutions in polished mahogany Case 4½ x 6¼ x 3¼ in, with switch,	each	$55 00
6028 N.	Electric Bell	"	75
6028 O.	Dry Cells	"	25
6028 P.	Electric Register, Bell and 4 Dry Cells in hardwood Case	"	62 00
6028 R.	Electric Bell and 2 Dry Cells, in hardwood Case . . .	"	3 50
6028 S.	Insulated Copper Wire, ...	per foot	03
6028 T.	Lead weight, about 75 lbs., with chain for anchoring No. 6023,	each	10 00

BOYDEN'S HOOK GAUGE



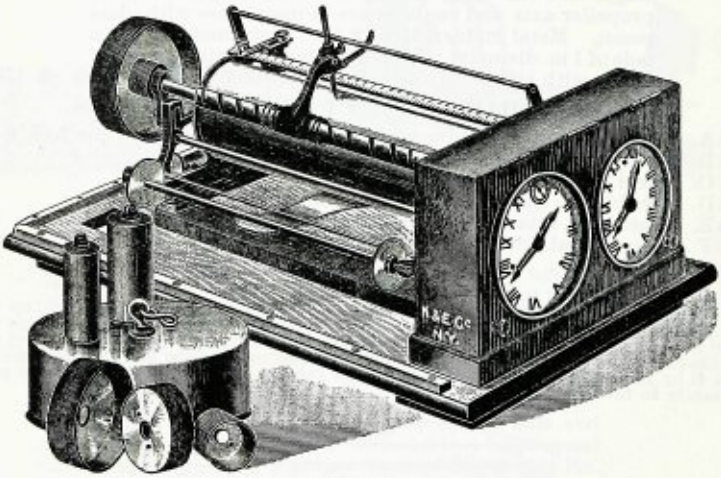
No. 6050.

6050. Boyden's Hook Gauge, mahogany, boxwood facing, brass mountings . . . . . each $20 00

Boyden's Hook Gauge for ascertaining the depth of water running over a dam, weir, etc., consists of a scale 2 ft. long, graduated to 100ths ft. and sliding in the groove of a frame, which carries also the vernier reading 1000ths ft. To the lower end of this sliding scale is attached a brass hook with a fine point, while the top end is provided with a micrometer screw.

SELF-REGISTERING TIDE GAUGE.

(C. & G. SURVEY MODEL.)



No. 6061.

6061. Self-registering Tide Gauge, as made by us for the U. S Coast & Geodetic Survey, brass cylinder 13¼ in., 2 rollers for record paper, adjustable metal scale, 4 interchangeable brass pulleys, float with counterweight, 2 independent clocks, instrument complete in strong hardwood Box $250 00

This is a very correct and reliable instrument. The registering pencil derives its motion from one of the clocks and records the tide as well as the time, the latter by an interruption in its mark at every hour. The travel of the periphery of the cylinder is 1 inch per hour. The 4 pulleys of different diameter (in the ratio 1:2:3:4) can be interchangeably attached to the end of the shaft carrying the pencil, so that the travel of the mechanism can be adapted to the extent of travel of the float.

6061 T. Record Paper for Self-Registering Tide Gauge (blank), per roll of 20 yards 50

GRADUATIONS AND NUMBERING

OF

KEUFFEL & ESSER CO'S.

LEVELING RODS.



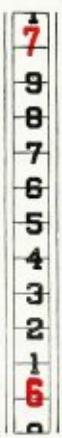
6250.
reads to
100ths feet



6251.
reads to
1 centimeter



6252-3.
reads to
100ths feet



6254—5.
6260—1.
6267—8.
by vernier
to 200ths feet.



6256—7.
6262—3.
6269.
6267½.
6268½.
by vernier
to 1000ths feet.



6258.
6264.
by vernier
to 1 m/m.



6270.
6271.
by vernier
to 1000ths
feet.

"Copyright, 1894, by Keuffel & Esser Co."



6274.
by vernier
to 1000ths
feet.



6276–
6277½.
read to
100ths feet



6280.
by vernier
to 64ths in.



6281.
by vernier
to 1000ths
feet.



6284.
6285.
reads to
100ths feet.



6288.
reads to
100ths feet.



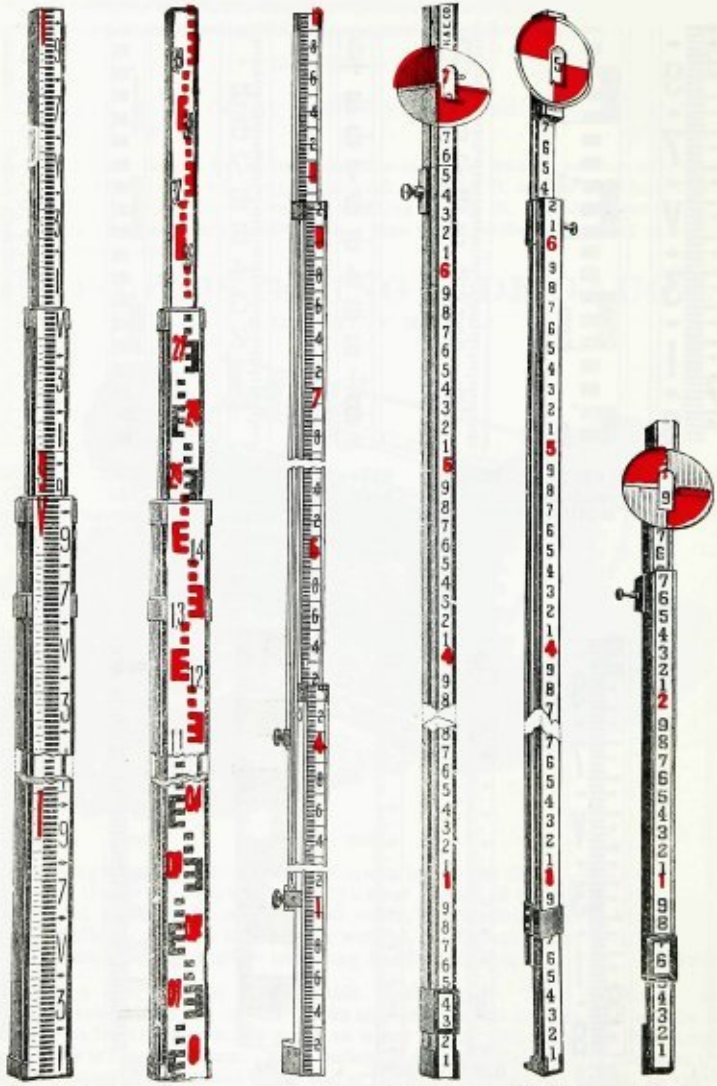
6330.
6332.
read to
100ths feet.

The numbers refer to illustrations and descriptions pages 460 to 463.

KEUFFEL & ESSER CO'S.

LEVELING RODS.

SUPERIOR QUALITY.



No. 6250. 6251. 6252. 6255. 6260. 6267.

For illustrations of graduations see preceding page.

THE ONLY MEDAL

awarded for



LEVELING RODS

was to

KEUFFEL & ESSER

AT THE NATIONAL EXPOSITION OF RAILWAY APPLIANCES, CHICAGO, 1883.



6250.	**English Self-reading Rod,**	telescoping, Mahogany, with strong brass mountings, 5 feet, sliding out to 14 feet .	each	$	22 50
6251.	do.	metric, 1.5 meter, sliding out to 4 meters	"		22 50
6252.	**Frisco Rod,**	Patented self-reading, with stout brass mountings, 3 ply, 4.4 feet, sliding out to 12 feet	"		12 00
6253.	do.	like No. 6252, but 5.4 feet, sliding out to 15 feet	"		14 00

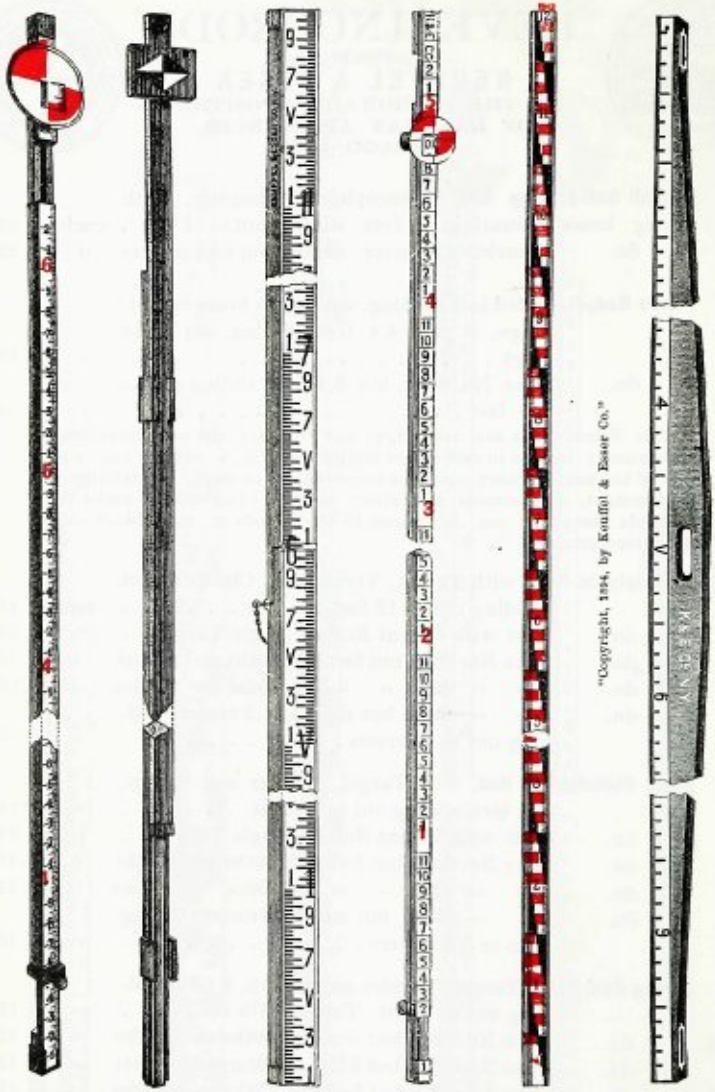
The Frisco Rods are very light and compact and can therefore be conveniently carried in railroad or trolley cars, in a buggy, etc., where rods of the usual pattern would be inconvenient to carry. Portability and light weight, compactness and short length when closed, make them desirable also for use in mines, in the woods or underbrush, or on obstructed ground.

6254.	**Philadelphia Rod,**	with Target, Vernier and Clamp, 7 feet sliding out to 13 feet	each	$	15 00
6255.	do.	but with Patent Rolling Angle Target . .	"		16 00
6256.	do.	like No. 6254, but feet div. 10ths and 100ths,	"		15 00
6257.	do.	" " 6255, " " " 10ths " 100ths,	"		16 00
6258.	do.	" " 6254, but metric, 2.2 meters sliding out to 4 meters	"		15 00
6260.	**Light Philadelphia Rod,**	with Target, Vernier and Clamp, 6½ feet, sliding out to 12 feet	"		13 00
6261.	do.	but with Patent Rolling Angle Target . .	"		14 00
6262.	do.	like No. 6260, but feet div. 10ths and 100ths	"		13 00
6263.	do.	" " 6261, " " " 10ths " 100ths	"		14 00
6264.	do.	" " 6260, but metric, 2 meters sliding out to 3.7 meters	"		13 00
6267.	**Mining Rod,**	with Target, Vernier and Clamp, 3 feet, sliding out to 5 feet, Target with slit	"		12 00
6267-½.	do.	like No. 6267, but feet div. 10ths and 100ths	"		12 00
6268.	do.	like No. 6267, but 5 feet, sliding out to 9 feet	"		12 75
6268-½.	do.	like No. 6268, but feet div. 10ths and 100ths	"		12 75

For illustrations of graduations see page 459.

For other Rods see next page.

For extra Targets, Patent Rolling Angle Targets and Rod Level, see pages 464, 465



No. 6270. 6274. 6276. 6280. 6285. 6288.

"Copyright, 1904, by Keuffel & Esser Co."

For illustrations of graduations see page 459.

For other Leveling rods see preceding pages.

No. 6269. (Patented)



6269. **Mining Rod,** Shropshire's patent, target with slit, vernier and clamp, 3.5 feet, sliding out to read 6 feet; graduations above first section are on self-winding metal band . . . . . each $18 00

The graduations are continued from the lower section to the full height of the rod on a metal band supported on a self-winding spring reel at the upper end of the rod.

When the upper section is extended, the graduated metal band is drawn off its reel, thereby presenting consecutive graduations and numbers at any extension, such as a rod of the usual construction presents only when extended to its full length. This rod is graduated to 100ths feet and reads by vernier on the target to 1000ths feet.

6270. **New York Rod,** Hardwood of light color, engine divided, with Target, Vernier and Clamp, 6½ feet sliding out to 12 feet . . . . . each $ 14 00

6271. do. like No. 6270, but with Patent Rolling Angle Target . . . . . " 15 00

6272. do. like No. 6270, but metric, 2 meters sliding out to 3.7 meters . . . . . " 14 00

6274. **Boston Rod,** Mahogany, engine divided on boxwood, with Target, 2 Verniers, 6½ feet sliding out to 11 feet . . . . . " 14 00

6276. **Telemeter Rod,** self-reading, folding, with strong bronze hinge, 12 feet, folding to 6 feet, 2 fold . . " 12 00

6276½. do. 12 " " " 4 " 3 " . . " 15 00

6277. do. 14 " " " 7 " 2 " . . " 13 50

6277½. do. 14 " " " 3½ " 4 " . . " 19 50

6280. **Architect's Rod,** light-colored Hardwood, brass mounted, with Target, Vernier and Clamp, engine divided to inches and ⅛ in., 5½ feet, sliding out to 10 feet . . . . . " 6 00

6281. do. like 6280, but divided 10ths and 100ths feet " 6 00

6284. **Florida Rod,** (in one piece), 10 feet, ... " 8 00

6285. do. " " " 12 " . . . . . " 10 00

6288. **Cross Section Rod,** 10 feet, graduated both sides in 10ths and 100ths feet, pinewood, two spirit levels, opening for the hand . . . . . " 10 00

FLEXIBLE OR POCKET LEVELING RODS.

No. 6330.



6330. Flexible Pocket Leveling Rod, 8 feet, div. 10ths and 100ths ft, ea. $ 3 00

6331. do. do. 10 " " " " " " " 3 25

6332. do. do. 12 " " " " " " " 4 00

6335. do. do. 12 " div. inches and ⅛ in., " 4 00

6340. do. do. metric, 3.5 meters, div. to centimeters " 4 00

These Rods are strips of prepared canvas, 3 in. wide, graduated like self-reading rods. For use they are fastened to a straight board with thumb tacks. When rolled up they are easily carried in the pocket. They are put up in neat decorated tin boxes.

For illustrations of graduations of pocket rods see page 459.

6335 S. Flexible Pocket Leveling Rod, 6 feet, 1½ in. wide, div. inches and ¼ inches, ... each $1 50

Rod No. 6335 S is intended for use with hand instruments and with the Farm Level.

RANGING POLES.



No. 6290. 6292.

Metal

6290. Iron Tubular Ranging Poles, $\frac{1}{8}$ in. diameter, painted red and white alternately every foot, 6 8 10 feet
each $ 2 75 3 00 3 50

6291. Steel Ranging Poles (solid), $\frac{1}{4}$ in. diameter, painted red and white alternately every foot, 6 8 feet
each $ 2 75 3 00

Wood

6292. Ranging Poles of best seasoned wood, round, tapered, painted red and white alternately every foot,
6 8 10 feet
each $ 2 00 2 25 2 50

6292S. Ranging Poles, **Sectional**, of best seasoned wood, round, in two sections, painted red and white alternately every foot. 8 10 feet
each $ 3 00 3 50

6293. Ranging Poles of best seasoned wood octagonal, tapered, painted red and white alternately every foot,
6 8 10 feet
each $ 2 00 2 25 2 50

Metric

6295. Ranging Poles, metric, of best seasoned wood, octagonal, tapered, painted red and white alternately every half-meter, 2 2½ 3 meters
each $ 2 50 3 00 3 75

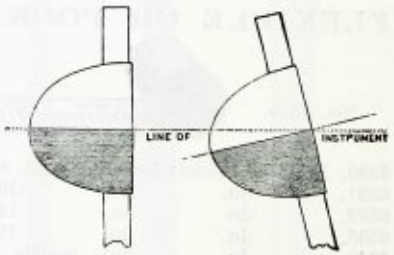
SEPARATE TARGETS

For K. & E. Co's. Leveling Rods.

6298. Target for heavy Philadelphia Rods . . . each $ 5 50
6298A. Target for light Philadelphia Rods . . . . " 5 00
6298B. Target for New York Rods . . . . . " 5 00

In ordering extra Targets, please give exact cross section of the rod for which they are intended, and state how rod is graduated, or give its catalogue number.





6298C. Rolling Angle Target, Thompson's Patent, with K. & E. Co's. Patent Rollers for Philadelphia Rods . . . . . each $ 6 00
6298D. do. do. for New York Rods . . . . . " 6 00

In ordering these targets, please state for which rod they are wanted and give cross section.

This Leveling Rod Target is devised to insure the rod being held perpendicular to

the observer's line of sight, by giving him full control of its position and an efficient check upon a careless rodman.

The horizontal dividing line of the target is carried over two surfaces placed at right angles to each other, thus showing a continuous and unbroken line only when the rod is held vertical.

Besides presenting a greater bearing surface to the rod, this target is steadier than the ordinary form, and when combined with K. & E. Co's. Patent Rollers, is the easiest to set, and the most convenient to shift. The rollers, with which the binding springs are provided, bear against the rod and enable the target to be moved up or down easily and without jerking, while they do not wear the rod but avoid scraping from the contact of the springs. **Rods 6255, 6257, 6261, 6263 and 6271 in preceding list have these Patent Rolling Angle Targets.**

ROD LEVEL.

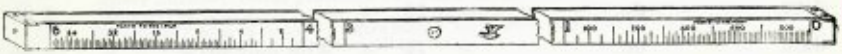


No. 6299.

6299. Rod Level, brass, circular spirit level 1 in. diam. . . . . each $ 3 00

This Rod Level is used for determining whether the rod is held perpendicular. The long angle plate insures proper contact when holding it to the rod, but it may be attached to the rod by means of a round-head screw for which there is a key-hole slot in the plate.

STANDARD MEASURES.



These measures are made corresponding to the U. S. Standard Measures in the Bureau of Standards at Washington.

6360. U. S. St'd. Measure, of seasoned pinewood, faced with hardwood, brass bound ends; 5 feet 3 in., divided in feet, the first foot in 10ths and 100ths, the last foot in inches in eighths, the last inch in 64ths in Case. . . . . each $ 7 00

6361. do. do. of seasoned pinewood, faced with hardwood, brass bound ends, 10 feet 3 in., divided in feet, the first foot in 10ths and 100ths, the last foot in inches and eighths, the last inch in 64ths, in Case . . . . . " 10 00

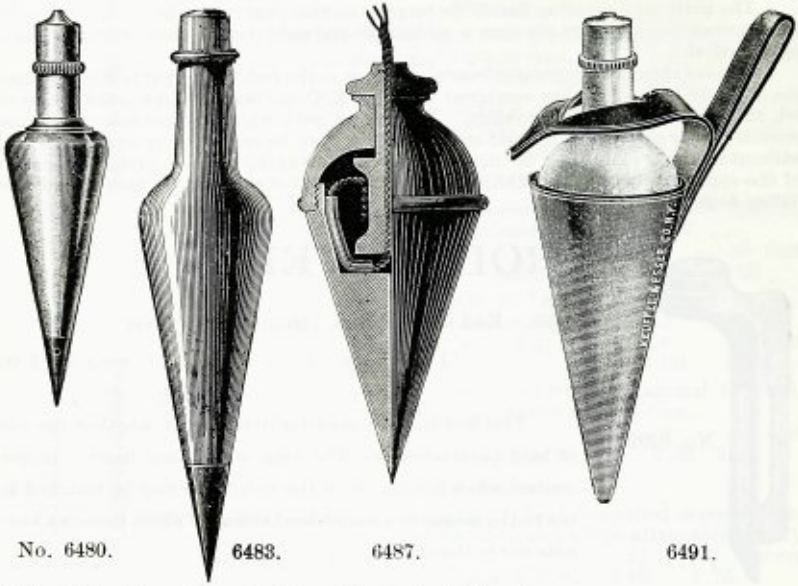
6362. do. do. of iron, $\frac{3}{4} \times \frac{1}{4}$ in., 5 feet 3 in., divided like No. 6361, but the last $\frac{1}{10}$ foot in 1000ths of a foot, in Case . . . . . " 15 00

6363. do. do. of iron, 10 feet 3 in., divided like No. 6362, in Case . . . . . " 30 00

6364. do. do. of brass, 1 meter, divided to millimeters, in Case . . . . . " 15 00

6365. do. do, of brass, 1 yard, divided in feet, one end-inch in 64ths, the other end-inch in 100ths, in Case . . . . . " 15 00

PLUMB BOBS.



No. 6480. 6483. 6487. 6491.

6480. Fine Brass Plumb Bob, with steel point and screw cap, about 6 ounces . . . . . each $ 1 50
6481. do. " 8 " . . . . . " 1 75
6482. do. " 12 " . . . . . " 2 00
6483. do. " 14 " with long neck . . " 2 25
6483-1. do. " 18 " " " " . . " 2 75
6484. do. " 24 " " " " . . " 3 25
6485. do. " 32 " " " " . . " 3 75
6486. do. " 48 " " " " . . " 5 00
6487. do. " 10 " with reel inside, on which the line is wound and held by friction at any point of its length . . . . . " 2 50
6488. Plain Iron Plumb Bob, about 7 ounces . . . . . " 75
6489. Plain Brass do. steel point, screw cap, about 8 ounces " 1 00
6490. do. do. " " " " 12 " " 1 50

SHEATHS FOR PLUMB BOBS.

6491 A. Sewed Leather Sheath, with belt loop for Plumb Bobs, 6 to 8 oz. . . . . each $ 35
6491 B. do. 12 to 14 oz. . . . . " 45
6491 C. do. 18 to 24 oz. . . . . " 55
6491 D. do. 32 to 48 oz. . . . . " 75

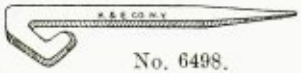
PLUMB BOB CORD.

6496. Plumb Bob Cord, best linen, thin, medium or thick . . per yard $ 02
6497. do. best braided silk . . . . . " " 06

STAKE TACKS. SPADS.



No. 6494.



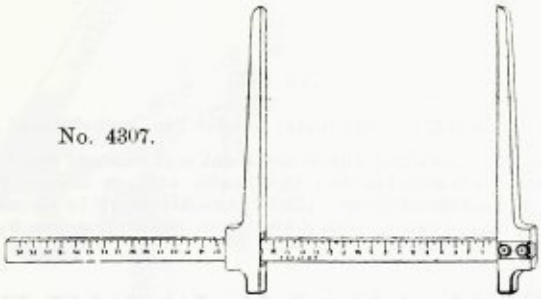
No. 6498.

6494. Stake Tacks, galvanized, tin box of 50 . . . . . $ 10
6495. " " " " " 100 15

These tacks have an indentation in the surface of the head, to guide the point of the plumb bob in exactly indicating location.

6498. Surveying Spads, Montgomery's, steel, for suspending plumb bob from timbers in mines, tin box of 50 75

TREE CALIPERS.



No. 4307.

4305. Tree Caliper, fine quality, hardwood, 18 inch, 1 clamp nut, each $ 3 15
4307. " " " " " 34 " 2 " " " 4 50
4309. " " " " " 50 " 2 " " " 5 50

These calipers are of light-colored hardwood, best workmanship, finely finished, beam graduated to 10ths inches and plainly numbered. The arms are detachable for convenience in transportation. The stationary arm is held by brass clamp nuts with lock nut. The eye of the sliding arm is brass-lined all around.

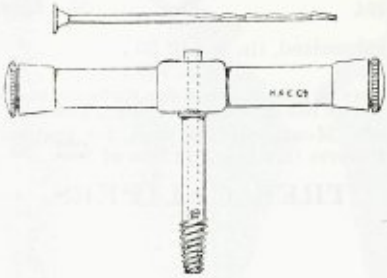
TREE TAPE (FORESTER'S TAPE).



7262. D. P. *Cornell* **K & E** Steel Tree Tape, **3/8 in. wide,** 50 ft., one side 10ths and 100ths feet, other side in the proportion of circumference to diameter to feet, 10ths and 100ths, stout bent leather case, patent centre, long swiveling flush folding handle opened by pushing handle pin from opposite side of case. Nickel plated mountings. Jointed anchor peg for fastening to tree. Graduations begin **at end of line** each $ 9 65

As the two sides of this tape are graduated in the ratio of diameter to circumference (1 : 3.1416), either dimension can be read off opposite the other.

INCREMENT BORER.

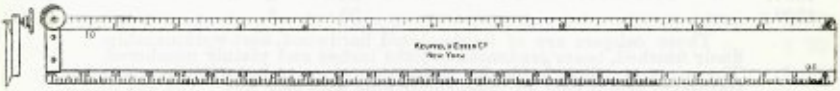


No. 4345.

4345. Increment Borer, tubular metal handle 7 in. nickelplated . each $ 6 00

The 3 in. hollow auger with square shank is of steel and with the steel plug-extractor is stored in the hollow handle, which is closed by screw caps. The Increment Borer (called "Zuwachsbohrer" by German foresters) serves to extract a plug of wood from the standing tree to determine its rate of growth.

STEM ANALYSIS RULES.



No. 4348.

4347. Stem Analysis Rules, 12 in., brass, nickelplated, engine divided, one edge to 10ths inches, the other to 20ths inches . . . . . each $ 2 50

4348. Stem Analysis Rules, 12 in., like No. 4347 but with centering pin on the 10ths inches edge . . . . . " 3 50

TIMBER SCRIBES.



No. 4350. 4352.

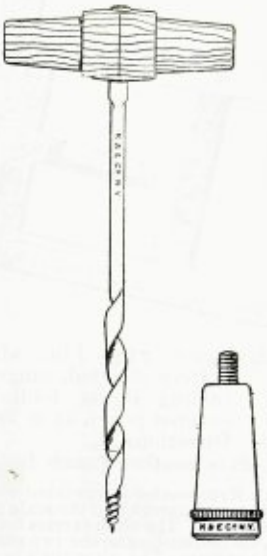
4350. Timber Scribe, wooden handle, small. (5 in.) . . . . . each $1 00

4352. " " " " large, (6½ ") . . . . . " 1 25

HYPSOMETERS.



No. 4400.



No. 4402. 4404.

4400. Hypsometer (after Klaussner). brass, graduated surfaces silvered, in wooden box 8 × $2\frac{3}{4}$ × $2\frac{3}{8}$ inches . . . . . each $26 00

This Hypsometer offers the advantage over most others that the total height of the tree or other object can be read direct from one scale and that it does not require the adding of the readings above and below the observer's level. The weighted altitude-scale is much steadier in the wind than a plumbbob.

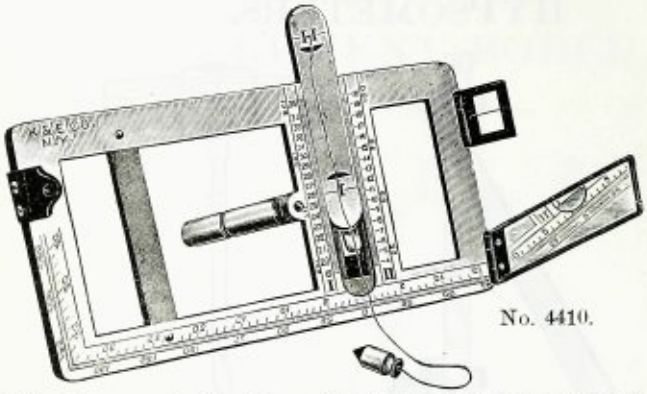
It is particularly adapted in cases where necessity of haste or the roughness of country make the use of a tripod impracticable, although the results obtained are more accurate when using a tripod than without one.

This Hypsometer consists of a base rule (6 in. long), a hinged sighting rule and an altitude-scale held vertical by a weight. The base rule is graduated up to 60 equal parts, each part divided to halves, forming the distance scale. It carries a slide with index line, to which the weighted altitude-scale is attached. The altitude-scale is graduated to 50 equal parts, each part divided to halves. The graduations may be read as yards, meters, feet or in any other unit, depending on the unit adopted in measuring the base line (from observer to object). The slide of the altitude-scale is set on the distance scale to correspond to the measured base line. The sighting rule is hinged to the near end of the base rule, and like the base rule, has a hair-line sight at its further end. At the joint of these two rules is a revolvable peep-sight, which can be directed to either of the two hairlines by turning a milled disk. After sighting the base of the object along the base rule, the sighting rule is raised by means of a high pitch thumbscrew, until its hairline cuts the top of the object. The instrument has a jointed ferrule with clamp screw which is threaded to fit the regular photographer's tripod screw.

4402. Gimlet Support, for attaching hypsometer to a tree or post, hard wood cross piece (handle) . . . . . each $ 1 00

4404. Brass Ferrule, to fit gimlet support or staffhead . . . . . " 1 00

For Jacob staff and Tripods see page 421.



No. 4410.



No. 4411.

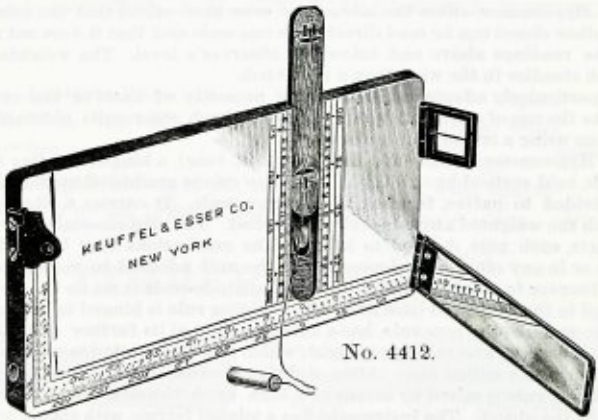
4410. Hypsometer $3\frac{1}{4}$ x 7 in., (after Faustmann), brass, graduated surface silvered, hinged mirror mounted in aluminum, folding sights, folding swiveling handle. In cloth covered pouch $3\frac{1}{2} \times 7\frac{1}{2} \times \frac{5}{8}$ in. with cover flap. With Directions . . . . . each $19 50

4410 S. Sole Leather Pouch for No. 4410, ... extra " 2 00

This Hypsometer is provided with two scales: the scale of heights on the lower edge of the instrument and the scale of distances on the two edges of the groove in which the slide moves. The slide carries the plumbbob thread and has two reading lines marked I and II, corresponding to the two scales of distances also marked I and II. It is held in place by a spring. The plumbbob is stored in a small tube at the back of the frame. The peep-hole and hairline sights and mirror ($5\frac{3}{4}$ x $\frac{3}{4}$ in.) are hinged to fold down.

4411. Brass Ferrule, to fit Gimlet Support, (No. 4402, p. 469). or staffhead . . . . . each $ 1 00

For Jacob staff and Tripods see page 421.

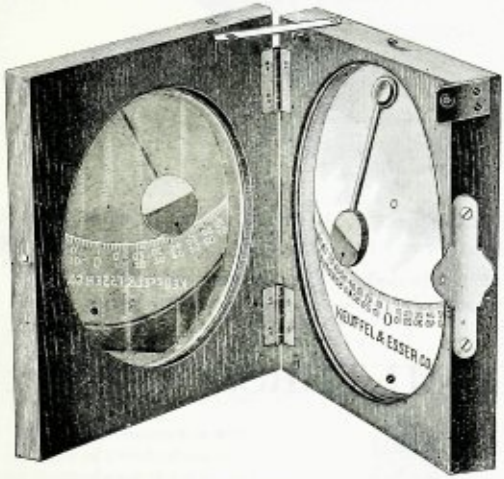


No. 4412.

4412. Hypsometer (after Faustmann), like No. 4410, but of polished hardwood, graduations on white facing with protective coating, hinged mirror mounted in aluminum, folding sights. In cloth covered pouch $3\frac{1}{2} \times 7\frac{1}{2} \times \frac{5}{8}$ in. with cover flap. With Directions, ... each $ 6 50

See also Military Clinometer, page 438

CLINOMETERS
FOR MEASURING HEIGHTS.



No. 4440.



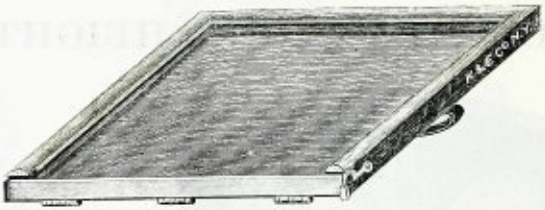
4442.

4440. Clinometer, mahogany frame with hinged cover, $4\frac{1}{2} \times 4\frac{1}{2} \times 1$ in., silvered metal dial with cover glass. Graduated to percentage of angle to 100% each way (by 2%), numbered at each 10%, with a second row of reversed numbers for reading in the mirror in the lid while sighting. The pendulum is held by a spring, except when released by pressing a button on the reverse side of the frame, so that its observed position can be fixed and read on the scale after the sighting. The upper edge has a peep sight and sighting pin. . . . . each $ 8 00

4442. Clinometer, mahogany frame $3 \times 3 \times \frac{1}{2}$ in., silvered metal dial with cover glass. Graduated to percentage of angle to 100% each way (by 2%), numbered at each 10%. The top or bottom of the frame serve as fiducial edge and for sighting. The pendulum is held by a spring, except when released by pressing a button on the reverse side of the frame, so that its observed position can be fixed and read after the sighting . . . . . " 4 00

See also Military Clinometer, page 438

TALLY SHEET HOLDERS.



No. 5724

5723. Tally Sheet Holder, for tally sheets 7×10 in . . . . . each $ 2 50
5724. do. do. " " " 10×12 " . . . . . " 4 00

The frames are of hardwood. The hinged side is of brass and is held by a hook. They are provided with strap handle.

PEDOMETERS.



No. 6905.

6900. Pedometer, watch pattern, nickel Case, 1¾ in., registering 12 miles by ¼ miles . . . . . each $ 4 50
6901. do. do. registering 50 miles by 80 yards " 5 25

Pedometers No. 6900 and 6901 indicate the **distance walked.** The hand advances in proportion to the length of stride, and the instrument is adjustable by an easily accessible screw.

6905. Passometer, watch pattern, nickel case, 1¾ in., registering to 100,000 steps . . . . . each $ 6 50

Passometer No. 6905 registers the **number of steps** walked and is not adjustable to length of stride. The distance walked can be computed from the number of steps registered.

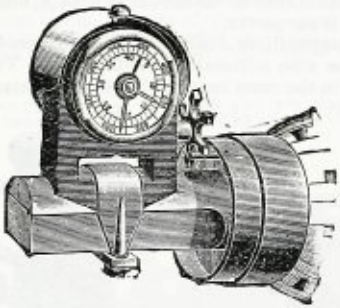
ODOMETERS.



No. 6910.

6910. Odometer of Brass, with silvered dials, in dustproof leather Case with Straps . . . . . each $ 15 00

The Odometer is attached to the spokes of a wheel near the hub. It registers the number of revolutions of the wheel up to 10.000, and the distance traveled is determined by multiplying the circumference of the wheel by the number of revolutions which the dial indicates.



No. 6912.

6912. Bell Odometer, for wheels of 44, 44½, 46 or 48 in. diameter, complete with attachments, record cards and directions . . . . . each $5 00

The Bell Odometer registers the distance traveled by vehicles of any description, and rings a small bell as each mile is passed. It keeps a record for 1600 miles and repeats. It is fastened to the axle and is operated by a steel pin driven into the end of the hub, or by special attachments furnished for wire wheels. These attachments propel the mechanism of the Odometer with each revolution of the vehicle wheel.

There are 3 hands (indexes) on the dial: The red hand registers 1 mile by 40th of a mile, the yellow hand registers 40 miles by single miles, the blue hand registers 1600 miles by spaces of 40 miles. The completion of each mile is distinctly announced by one sharp stroke of a small bell in the instrument. The bell is a valuable feature, as the driver is enabled without even looking at the Odometer to tell how far or how fast he is traveling.

EXTRA FINE

FIELD AND MARINE GLASSES.

We confine our stock to the finest and best quality of Field and Marine Glasses as only these are desirable and required for Engineering.

While not equal, either in size of field or in magnifying power, to the long terrestrial telescope or "spy glass", the ordinary field glass has several points in its favor as compared with the long telescope. It is extremely light, handy and compact, and slips easily into its small leather case, which constitutes sufficient protection even against severe shocks. It is trained and focused in a few seconds. Having only two separate optical elements in each barrel, viz:—a cemented objective and a cemented or single-lens eyepiece, it is much less liable to get out of order than either the Spy Glass or the Prism Binocular with their 5 or more separate lenses or prisms. It is therefore par excellence the glass for field use, where very high magnification is rarely required and where handiness and the power to withstand rough usage are among the most essential qualities.

Our assortment of field glasses is selected with a view to satisfying all possible requirements, both for surveyors and general use, and all glasses are of the very best quality optically, giving excellent definition throughout their field of view.

In the choice of a field glass it is always advisable to select as low a magnifying power as possible. The higher the power of any glass the smaller will be the field of view, the greater the difficulty of keeping the glass steady, and the more noticeable and detrimental all atmospheric influences, such as heat radiation or haze. Also, as with the higher magnification, the light emanating from the object is spread out over a large area, the illuminating will suffer accordingly and the image will appear much less brilliant and distinct. All these points render observations with a high-power glass much more difficult than with one of lower power.

Observers whose interpupillary distance deviates considerably from the normal, are advised to use glasses with adjustable eye-distance. The adjustment is made by means of a pair of hinges in the cross bars joining the two barrels of the field glass.



No. 6921.

Copyright, 1900, by Keuffel & Esser Co.



6923.

6921. Field and Marine Glass, object glass 14 lines, power about 4 times, glass with shoulder cord, in stiff leather Sling Case, ... each $11 50

6923. do. do. object glass 15 lines, power about 4 times, glass with shoulder cord in stiff leather Sling Case, ... " 11 50

"Copyright, 1890, by Keuffel & Esser Co."



No. 6924.



6925.

6924. Field and Marine Glass, object glass 15 lines, like No. 6923 but with sun shades . . . . . each $13 25

6925. do. do. aluminum, covered with black morocco, object glass 15 lines, power about 4 times, glass with shoulder cord, in stiff leather Sling Case, " 15 50

Engineers and others who use glasses frequently, will welcome these little Field glasses, No. 6924-6925, which are of about the size of Opera glasses. They are specially adapted for the use of Engineers etc., have a large field, good light and good definition and as much power as the older style large and heavy glasses. The low prices at which we are offering them should not be taken as an indication of their quality.

6926. Field and Marine Glass, japanned and covered with morocco, object glass 21 lines, 8 lenses, two magnifying powers, about 3 and 5 times, with shoulder cord, in soft leather Sling Case with handle . . . . each $ 13 25

The two powers of this glass are produced by a movable compensating lens in the eyepiece, which drops into the field or out of it according to the position in which the glass is held. The upper cross-bar is marked "Far" and "Near". The magnifying power actually in use in each position is engraved on the upper cross bar.

In the glasses No. 6927 to 6934 inclusive, the focusing screw is independent of the telescoping arrangement, so that closing the glass and drawing the tubes out will not disturb the focus to which they have been adjusted by the focusing screw.

"Copyright, 1894, by Keuffel & Esser Co."



No. 6927

6927. Field and Marine Glass, japanned and covered with morocco, object glass 24 lines, 8 lenses, magnifying power about 3¾ times. The telescoping bar is independent of the focusing screw, as described above. In soft leather Sling Case, ... each $ 18 50

The glass No. 6927 represents a happy compromise between the magnifying power and the size of the field, as neither of these factors has been reduced at the expense of the other. This makes it particularly well adapted for a search glass and for general use.

6928. Field and Marine Glass, japanned and covered with morocco, with sun shades, object glass 17 lines, 6 lenses, magnifying power about 4½ times. The telescoping bar is independent of the focusing screw, as described on page 475. Glass with shoulder cord, in stiff leather Sling Case . . . . . each $ 17 25

6929. Field and Marine Glass, japanned and covered with morocco, like No. 6928, but object glass 19 lines, magnifying power about 6 times . . . . . " 19 50



"Copyright, 1904, by Keuffel & Esser Co."

No. 6930.

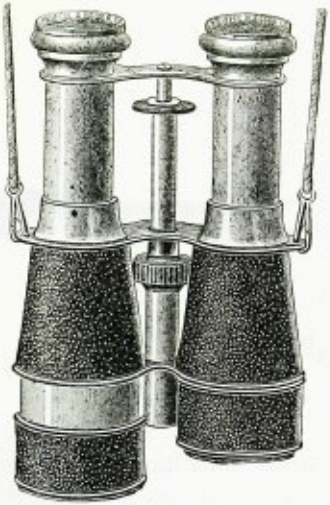
6930. Field and Marine Glass, japanned and covered with morocco, object glass 21 lines, 6 lenses, two magnifying powers, about 3½ and 6 times. The telescoping bar is independent of the focusing screw, as described on page 475. Glass with shoulder cord, in stiff leather Sling Case, ... each $ 20 50

In glass No. 6930, the power is changed by a revolving cross-bar provided with a milled head. The central part of the bar, between the oculars, has separate faces marked to show which power is in use. The use of the independent telescoping arrangement is of course, limited to that power for which the focus has been adjusted.

6931. Field and Marine Glass, japanned and covered with morocco, with sun shade, object glass 19 lines, 6 lenses, magnifying power about 8 times. The telescoping bar is independent of the focusing screw, as described on page 475. Glass with shoulder cord, in stiff leather Sling Case (see cut of No. 6934 on opposite page) . . . . . each $ 21 00

6932. Field and Marine Glass, like No. 6931, but magnifying power about 10 times (see cut of No. 6934) . . . . " 23 00

6933. Field and Marine Glass, like No. 6931, but of aluminum, covered with morocco, power about 8 times, (see cut of No. 6934) . . . . . " 25 00



No. 6934.

6934. Field and Marine Glass, like No. 6932, but of aluminum, covered with morocco, power about 10 times . . . each $ 27 75

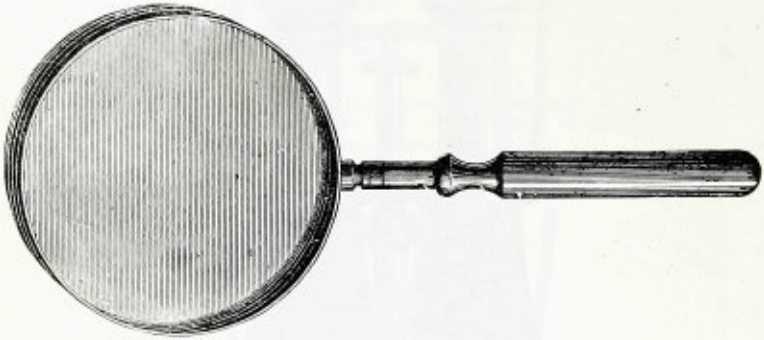


No. 6935½

6935. Field and Marine Glass, japanned and covered with morocco, with sun shades, object glass 21 lines, 6 lenses, magnifying power about 3 times, in stiff leather Sling Case . . . . . each $ 15 50

6935½. Field and Marine Glass, like No. 6935, but object glass 24 lines . . . . . " 17 00

MAGNIFYING GLASSES.



No. 6970.

6970. Reading Glasses, **German Silver** Rim, Black Handle, **Best Quality**.

	1½	2	2½	3	3½	4	4½	5 in.
each $	55	75	95	1 30	1 75	2 35	3 00	3 75

POCKET MAGNIFYING GLASSES

MOUNTED IN METAL.



No. 6980.



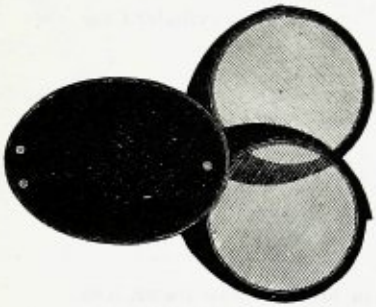
6986.

6975.	Round,	nickelplated	frame,	1	lens,	1	in.	. . . . .	each	$	70
6980.	do.	bronzed	"	1	"	1	"	. . . . .	"		40
6981.	do.	"	"	2	"	1	"	. . . . .	"		65
6982.	do.	"	"	3	"	1	"	. . . . .	"		1 00
6985.	do.	German silver	"	1	"	1	"	. . . . .	"		75
6986.	do.	" "	"	2	"	1	"	. . . . .	"		1 00
6987.	do.	" "	"	3	"	1	"	. . . . .	"		1 30

These glasses have a large, flat field and good magnifying power and are well adapted for reading graduations on Surveying Instruments. As they are mounted in metal they are more durable than those mounted in hard rubber. The mountings are non-magnetic.

POCKET MAGNIFYING GLASSES

MOUNTED IN RUBBER.

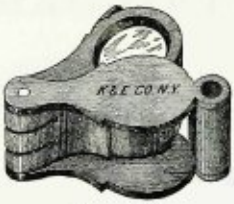


No. 7002.



7008.

7000.	Oval Pattern,	1 lens,	1	in.	diameter	each	$ 35
7001.	do.	1 "	1½	"	"	"	55
7002.	do.	2 lenses,	1	"	"	"	60
7008.	do.	2 "	1½	"	"	"	1 00
7006.	Round Pattern,	1 lens,	⅞	"	"	"	35
7007.	do.	1 "	1	"	"	"	40
7008.	do.	2 lenses,	⅞	"	"	"	50
7010.	do.	2 "	1	"	"	"	65
7012.	do.	3 "	⅞	"	"	"	70
7013.	do.	3 "	1	"	"	"	95



No. 7021.

"Copyright, 1890, by Keuffel & Esser Co."



7022.

7021. Pocket Magnifier, **achromatic,** in bronzed brass Frame, lens $\frac{3}{4}$ in., power about 5 times, a very fine glass with good definition, for examining ore, etc. . . . . each $ 6 50

7022. do. do. do. but in brass cylinder Case " 7 25



No. 7023.

"Copyright, 1890, by Keuffel & Esser Co."



7024.

7023. Pocket Magnifier, **achromatic,** in bronzed brass **frame,** lens $\frac{1}{4}$ in., power about 12 times, a glass of extra power, each $ 5 75

7024. do. do. do. lens $\frac{3}{8}$ in., power about 5 times, " 4 50



No. 7026.

7025. Coddington Lens, brass frame and handle, nickelplated, $\frac{3}{4}$ in. each $ 1 25

7026. do. " " " " " 1 " " 1 40

7027. do. " " wooden handle " $1\frac{1}{8}$ " " 1 75

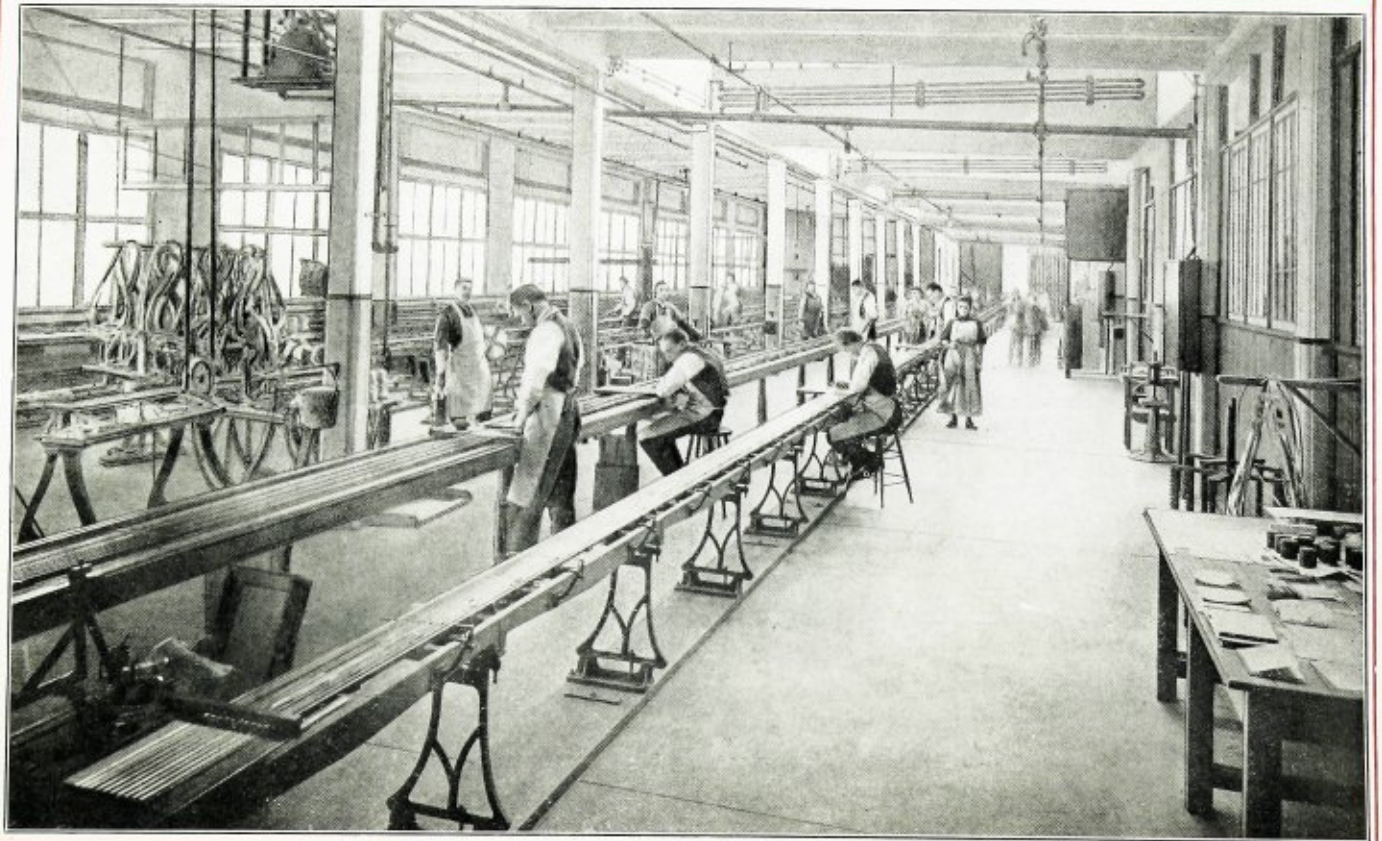
THREAD COUNTERS.

7035. Thread Counter, folding brass frame, $\frac{1}{4}$ in. field . . . . . each $ 35

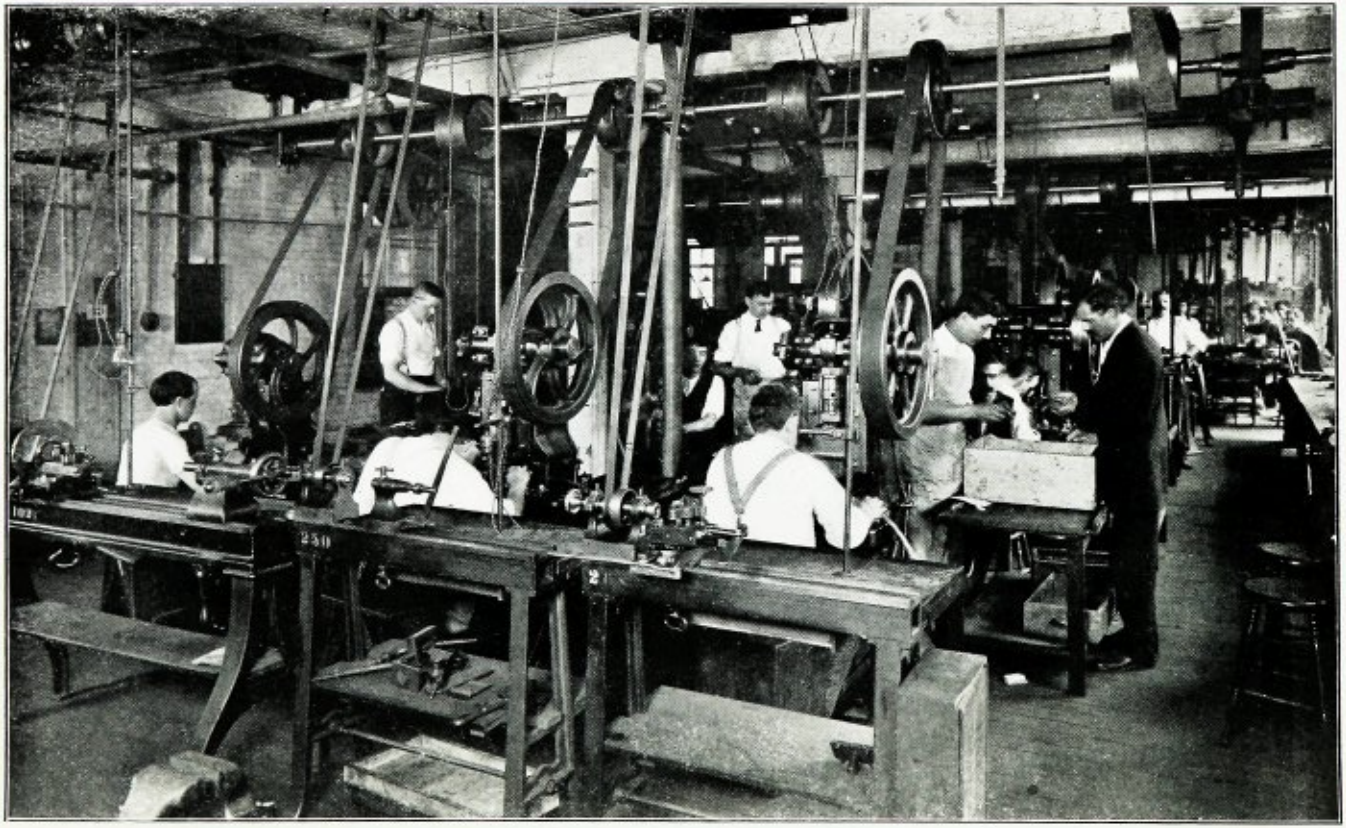
7036. do. " " " $\frac{1}{2}$ " " . . . . " 60

7037. do. " " " 1 " " . . . . " 2 00

KEUFFEL & ESSER CO. NEW YORK.

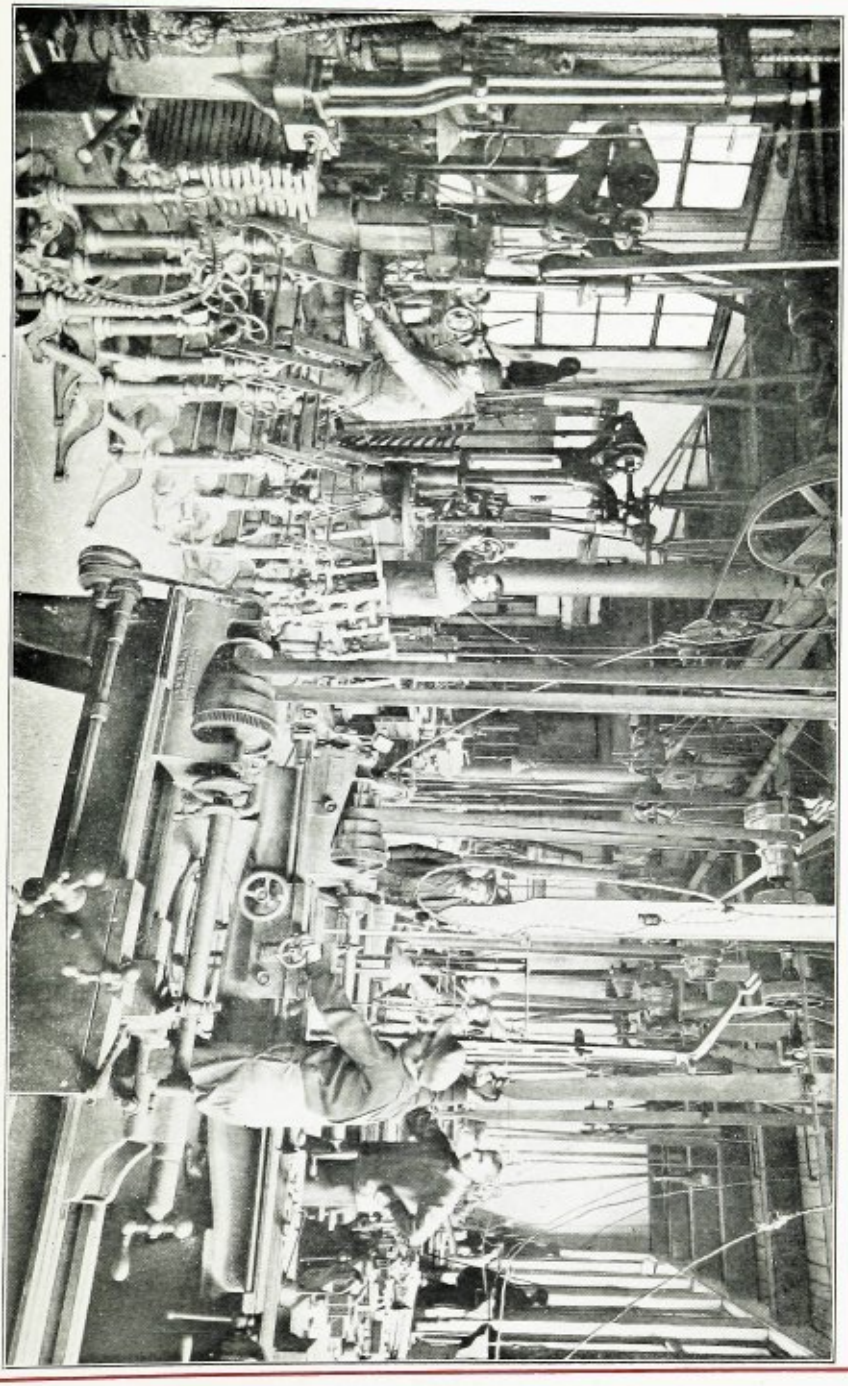


GRADUATING MEASURING TAPES.—FACTORIES, HOBOKEN, N. J.

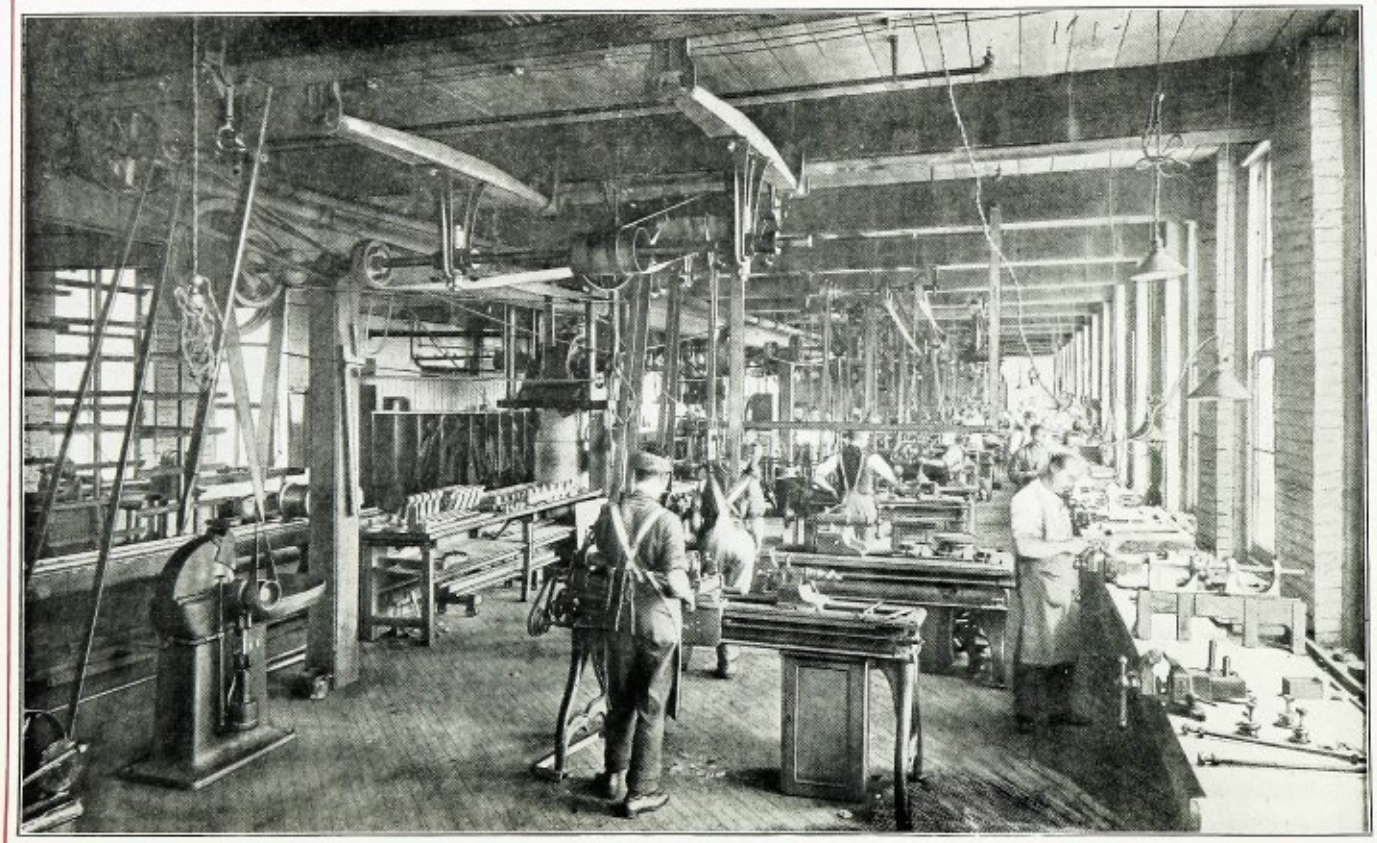


KEUFFEL & ESSER CO. NEW YORK.

PRESS AND STAMPING ROOM.—FACTORIES, HOBOKEN, N. J.



MACHINE SHOP. — FACTORIES, HOBOKEN, N. J.



KEUFFEL & ESSER CO. NEW YORK.

TOOL MAKING.—FACTORIES, HOBOKEN, N. J.

K & E MEASURING TAPES.

(Patented and Patents pending.)

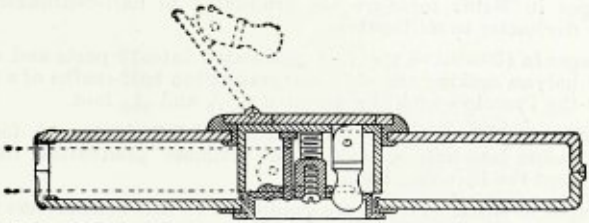
Manufactured by

KEUFFEL & ESSER CO.

These **American-made** tapes are recommended for their superiority in *material, workmanship, accuracy* and *design*. They are graduated according to the U. S. Standard of the National Bureau of Standards. Our Steel Tapes are standard at 62°F.

K & E IMPROVED CENTRE.

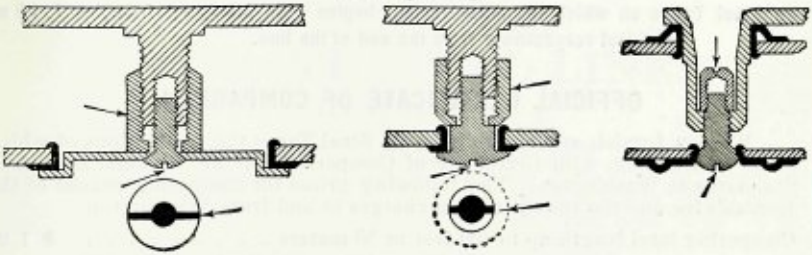
(Patented)



The **K & E Patent Centre** with flush folding handle, as shown in cut, has a large drum with long handle crank which winds the tape quickly and easily and avoids the close coiling which injures the steel lines. A long, jointed swiveling handle pin, when closed, protrudes beyond the surface of the tape case, so that the handle crank can be thrown open by pressing the end of the handle pin from the reverse side.

ADJUSTABLE CENTRES.

Patent pending.



Owing to wear, the nice adjustment of the centre of a tape suffers in time, resulting in difficulties when winding or unwinding the tape. **All** K & E Measuring Tapes are now made with Adjustable Centres, allowing re-adjustment for wear in the centre and giving just the friction desired.

KECO FINISH.

By this name we designate the superior finish which we now put on all our steel tape lines. It produces a dense, even black tape line with brilliant bright steel graduations and figures. The **Keco** finish wears well, guards against rusting and obviates the necessity of greasing the line to protect it.

EXTRA-LONG TAPES.

We list our tapes in lengths up to 100 feet. If they are wanted of greater length, we make them to order in any of our styles with suitable cases or reels. For lengths beyond 100 feet, the Flat Wire Tapes and the Band chains (page 503 &c.) are generally preferred.

SUBDIVISIONS.

Steel Tapes in **10ths** have the foot graduated into 10 parts and each $\frac{1}{10}$ again into 10 parts, making the ultimate graduation $\frac{1}{100}$ foot.

Steel Tapes in **12ths** have the foot graduated into inches ($\frac{1}{12}$ foot) and each inch into eighths, making the ultimate graduation $\frac{1}{8}$ inch, except the Liliput, Midget, Dwarf and Mechanic's which are graduated to $\frac{1}{16}$ inch.

Steel Tapes in **Metric** measure are graduated to half-centimeters, the first decimeter to millimeters.

Woven Tapes in **10ths** have the foot graduated into 10 parts and each $\frac{1}{10}$ into halves, making the ultimate graduation half-tenths of a foot, except the Piccolo which is graduated to $\frac{1}{10}$ and $\frac{1}{100}$ foot.

Woven Tapes in **12ths** have the foot graduated into inches ($\frac{1}{12}$ foot) and the inches into halves, making the ultimate graduation half-inch, except the Piccolo $\frac{1}{8}$ inch.

Woven Tapes in **Metric** measure are graduated to half-centimeters throughout, except Favorite Tapes to centimeters.

Spring Winding Steel Pocket Tapes are graduated into **inches** in sixteenths up to 6 feet lengths; longer tapes are in **feet**, inches and sixteenths, or feet in **tenths** and 100ths; **Metric** to millimeters throughout.

Tip Top Tapes are graduated into inches in sixteenths, except Nos. 7713 T. F. and 7723 T. F. which are in feet, inches and sixteenths; **Metric** to millimeters throughout.

On Steel Tapes on which the measurement begins "on the line" it begins 1/10 or 1/12 foot respectively from the end of the line.

OFFICIAL CERTIFICATE OF COMPARISON.

We can furnish any of the **K & E** Steel Tapes the graduations of which BEGIN ON THE LINE, with Certificate of Comparison of the National Bureau of Standards at Washington. The following prices for comparing consist of the Bureau's fee and the transportation charges to and from Washington.

Comparing total length up to 100 feet or 50 meters	$ 1 25
" " " " 200 feet or 100 meters (including the 100 feet or 50 M. division)	1 75
Comparing total length up to 300 feet (including the 100 and 200 feet divisions)	2 25
Comparing any further subdivision . . . . . each	10

The above prices are for comparing tapes supported throughout their entire length. For comparing tapes supported at intervals, an additional charge of 50 cts. will be made for each 100 feet or 50 meters of length.

The National Bureau of Standards furnishes a certificate, stating among other data, the temperature at which comparison was made, the tension at which tape was compared, and the length corrected for the standard temperature of 62° F.

No certificate is furnished, unless the terminals of the measurement are **on the line**, i.e., not on the handle or end-ring.

K & E STEEL TAPES WITH THERMOMETER SCALE.



Ending of 100 foot tape with Thermometer Scale. Actual size.

F.S. Patent Thermometer Scale on 50 or 100 foot tape, ... extra $ 1 00

As a means of obtaining additional accuracy and uniformity in measuring we recommend **steel tapes with thermometer scale.** This scale, which is numbered to correspond to the Fahrenheit thermometer, takes the place of the terminal 50 foot or 100 foot mark. At 62° F, at which the **K & E** tapes are standard, the thermometer reading will coincide with the terminal mark of the tape graduation. At any other temperature it will be on the thermometer scale: For instance, at 80° the terminal mark will be at the graduation numbered 80 on the thermometer scale, at 20° it will be at the graduation numbered 20, etc., etc. The 50 or 100 feet point should therefore be read at that mark on the thermometer scale which corresponds to the thermometer reading at the time of taking the measurement. The above cut, which is actual size, will show how important it is for exact measuring to make this correction for temperature, as the variation in 100 feet between 90°+ and 20°—is about .08 feet. (The fig. "9" in the cut is the 9th tenth of the last foot of a 100 foot tape).

This scale can not be applied to Liliput, Midget, Dwarf, Home or Armor Tapes nor to tapes less than one-quarter inch wide, nor to Bandchains

K & E STEEL TAPES WITH STATED TENSION.

T.E. Determining the tension, and etching it on the line, extra . . . $ 1 00

To secure uniformity in measurements we etch on any of our steel tapes (except Liliput, Midget, Dwarf, Home and Armor) the **tension** (in pounds) at which the tape is standard at 62° F. when supported for its entire length, and also when supported by its ends only.

SEPARATE STEEL LINES.

RE-FILLS.

Length in feet.	25	33	50	66	75	100
1/2 in. wide, one side graduated . . each $		4 00	6 00	7 90	8 80	11 20
3/8 " " " " " . . "	2 80	3 50	5 25	7 00	7 80	10 00
5/16 " " " " " . . "	2 65	3 15	3 90	4 90	5 85	7 30
1/4 " " " " " (for Liliput, Midget and Dwarf. "	2 20		2 70			

NICKELPLATING STEEL TAPE LINES.

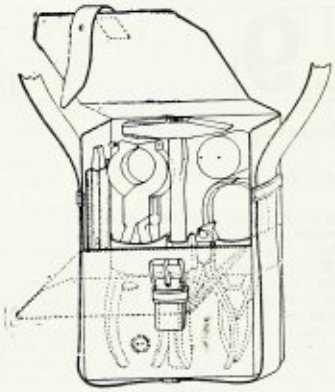
We are prepared to furnish our steel tape lines nickelplated in the best and most durable manner (for protection against rust) at the following extra charge:

Length in feet,	25	33	50	66	75	100
each	$ 90	1 00	1 50	1 75	1 75	2 00

REPAIRING TAPES.

We promptly attend to any repairs on steel or woven tapes and execute them in the most approved manner at moderate charge.

K & E MENDING OUTFIT.



No. 7096.

Outfit for mending tapes in the field.

This outfit consists of one rivet set, one punching pliers, one riveting hammer, one end-nippers, one pair shears, one anvil, one centre punch (for heavy band chains, to be used preliminary to the punching pliers) one three-square file. It is put up in a sewed leather case 5 x 7¼ in., with carrying strap and weighs complete about 30 ounces. In the case is a separate pouch with rivets and sleeves for flat wire tapes.

With this outfit all kinds of measuring tapes can be quickly and durably repaired in the field. The Flat Wire Tapes, for which we furnish clamping sleeves, are first notched by the three-square file and the sleeves are pressed into the notches by the end-nippers. This makes a strong joint.

7096. K & E Tape Mending Kit, in sewed Leather Sling Case, with rivets and metal sleeves . . . . . each $ 9 75

TAPE MENDING TOOL.



No. 7098.

7098. Tape Mending Tool combined cutter and riveter, a light and convenient tool for quickly repairing tapes in the field.

Tool, with 1000 eyelets (500 each of two sizes) . . . . . $ 4 00
Extra eyelets (500 in a package) . . . . . per mille 1 25

K & E
STEEL MEASURING TAPES.



Please order by number.

Stevens **K & E** Steel Tapes, **1/2 in. wide,** patent brass frame, patent centre, long swiveling flush folding handle opened by pushing handle pin from opposite side of frame. Frame and all mountings nickel-plated. Graduations begin **on the line.**

Length in feet,	50	100
10ths of feet	No. 7102*D*	7105*D*
12ths " "	7102*T*	7105*T*
	each $ 7 15	12 85
10ths of feet and Links	No. 7102*DL*	7105*DL*
12ths " " " "	7102*TL*	7105*TL*
	each $ 7 35	13 15

Length in Meters,	15	30
Metric (one side only)	No. 7102*M*	7105*M*
	each $ 7 15	12 85
Metric, other side 12ths of feet	No. 7102*TM*	7105*TM*
	each $ 8 40	15 30

Madison **K & E** Steel Tapes, **5/16 in. wide, Paine's pattern,** patent brass frame, large centre, long swiveling flush folding handle opened by pushing handle pin from opposite side of frame. Frame and all mountings nickelplated. Two handles for tape line. Graduations begin **at end of line.**

Length in feet,	50	100
10ths of feet	No. 7122*D*	7125*D*
12ths " "	7122*T*	7125*T*
	each $ 7 15	12 85

Length in Meters,	15	30
Metric (one side only)	No. 7122*M*	7125*M*
	each $ 7 15	12 85
Metric, other side 12ths of feet	No. 7122*TM*	7125*TM*
	each $ 8 40	15 30

For Patent Thermometer Scale, Etching Tension on Line, Nickelplating Tape Lines, see page 483.

K & E STEEL TAPES.



Please order by number.

Ohio K & E Steel Tapes, 1/2 in. wide, on patent brass frame, large centre with long folding handle, frame and all mountings nickelplated. Graduations begin on the line.

	Length in feet.	50	100
10ths of feet	No.	7152*D*	7155*D*
12ths " "		7152*T*	7155*T*
	each	$ 5 10	8 75
	Length in Meters,	15	30
Metric (one side only)	No.	7152*M*	7155*M*
	each	$ 5 10	8 75
Metric, other side 12ths of feet	No.	7152*TM*	7155*TM*
	each	$ 6 30	11 20

Texas K & E Steel Tapes, 3/8 in. wide, on patent brass frame, large centre with long folding handle, frame and all mountings nickelplated. Graduations begin on the line.

	Length in feet	50	100
10ths of feet	No.	7162*D*	7165*D*
12ths " "		7162*T*	7165*T*
	each	$ 4 40	7 55
	Length in Meters	15	30
Metric (one side only)	No	7162*M*	7165*M*
	each	$ 4 40	7 55
Metric, other side 12ths of feet	No.	7162*TM*	7165*TM*
	each	$ 5 60	10 00

Maine K & E Steel Tapes, 5/16 in. wide, Paine's Pattern, on patent brass frame, large centre with long folding handle, frame and all mountings nickelplated, two handles for tape line. Graduations begin at end of line.

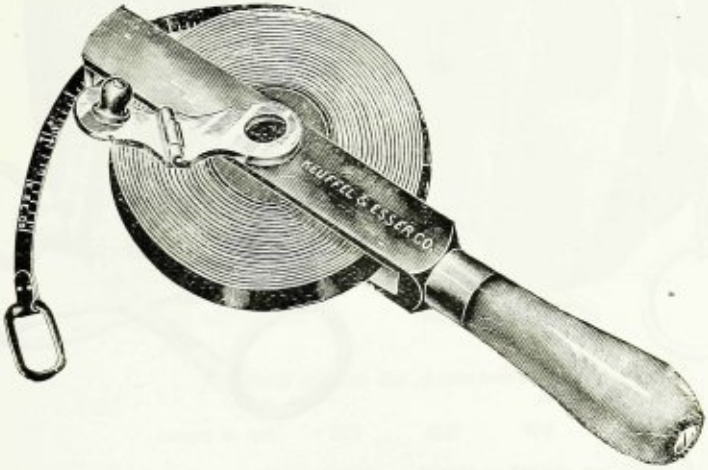
	Length in feet	50	100
10ths of feet	No.	7172*D*	7175*D*
12ths " "		7172*T*	7175*T*
	each	$ 5 10	8 75
	Length in Meters	15	30
Metric (one side only)	No.	7172*M*	7175*M*
	each	$ 5 10	8 75
Metric, other side 12ths of feet	No.	7172*TM*	7175*TM*
	each	$ 6 30	11 20

For Patent Thermometer scale, Etching Tensionon Line, Nickelplating Tape Lines, see page 483.

K & E BRONZE TAPES.

(Special Bronze Alloy)

RUST PROOF.



Please order by number.

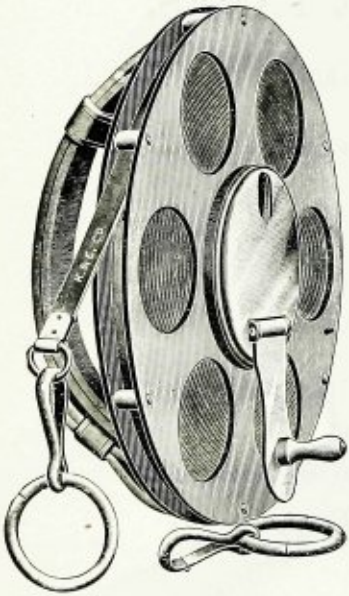
K & E Bronze Tape, 1/2 in. wide, on patent brass frame, large centre with long folding handle, frame and all mountings nickelplated. Graduations begin **on the line.**

Length in feet.	50	100
10ths of feet	No. 7387*D*	7389*D*
12ths of feet	No. 7387*T*	7389*T*
	each $ 7 75	13 25

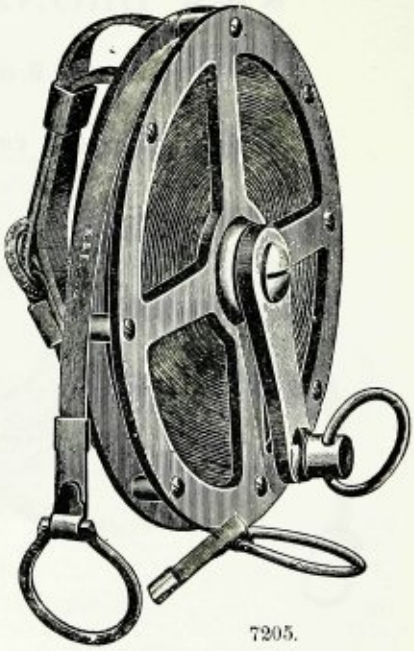
The Bronze Tapes are intended for use in salt or fresh water, mine waters, on board ship, &c. The lines are heavy bronze ribbon and the graduations are sharp and easily read.

Bronze Tapes in other measures or of other lengths made to order.

K & E STEEL TAPES.



No. 7185.



7205.

Berkeley **K & E** Steel Tapes, 1/4 **in. wide,** metal reel with leather strap handle, large centre with long folding handle. Two handles for tape line. Reel and all mountings nickelplated. Graduations begin **on the line.**

Please order by number.

	Length in feet,	50	100
10ths of feet		No. 7182 *D*	7185 *D*
	each	$ 8 00	12 90
	Length in Meters,	15	30
Metric (one side only) . . .		No. 7182 *M*	7185 *M*
	each	$ 8 00	12 90

Purdue **K & E** Steel Tapes, 1/4 **in. wide,** Paine's pattern, heavy brass reel with leather strap handle, large centre with long crank and swiveling ring handle. Two handles for tape line. Reel and all mountings nickelplated. Graduations begin **at end of line.**

	Length in feet,	50	100
10ths of feet		No. 7202 *D*	7205 *D*
	each	$11 00	17 00
	Length in Meters,	15	30
Metric (one side only) . . .		No. 7202 *M*	7205 *M*
	each	$11 00	17 00

The Purdue is an extra-heavy tape, intended for rough accurate work.

For Patent Thermometer Scale Etching Tension on Line, Nickelplating Tape Lines, see page 483.

K & E STEEL TAPES.



Columbia **K & E** Steel Tapes, 1/2 **in. wide,** stout bent leather case, patent centre, long swiveling flush folding handle, opened by pushing handle pin from opposite side of case. Nickelplated mountings. Graduations begin **at end of line.**

Please order by number.

Length in feet.	**33**	**50**	**66**	**75**	**100**
10ths of feet	No. 7231*D*	7232*D*	7233*D*	7234*D*	7235*D*
12ths "	7231*T*	7232*T*	7233*T*	7234*T*	7235*T*
each	$ 5 35	7 50	9 55	10 80	13 40
10ths of feet and Links . . .	No. 7231*DL*	7232*DL*	7233*DL*	7234*DL*	7235*DL*
12ths " " . . .	7231*TL*	7232*TL*	7233*TL*	7234*TL*	7235*TL*
each	$ 5 55	7 70	9 85	11 10	13 70

Length in Meters.	**10**	**15**	**20**	**25**	**30**
Metric (one side only) . . .	No. 7231*M*	7232*M*	7233*M*	7234*M*	7235*M*
each	$5 35	7 50	9 55	11 80	13 40
Metric, other side 12ths of feet	No. 7231*TM*	7232*TM*	7233*TM*	7234*TM*	7235*TM*
each	$ 6 15	8 75	11 15	13 80	15 85

For Patent Thermometer Scale, Etching Tension on Line, Nickelplating Tape Lines, see page 483.

K & E STEEL TAPES.



Cornell **K & E** Steel Tapes, 3/8 **in. wide,** stout bent leather case, patent centre, long swiveling flush folding handle, opened by pushing handle pin from opposite side of case. Nickelplated mountings. Graduations begin **at outside end of ring.**

Please order by number.

Length in feet.		**25**	**33**	**50**	**66**	**75**	**100**
10ths of feet	No.	7250*D*	7251*D*	7252*D*	7253*D*	7254*D*	7255*D*
12ths " "		7250*T*	7251*T*	7252*T*	7253*T*	7254*T*	7255*T*
	each	$ 4 15	4 75	6 65	8 45	9 60	11 85
10ths of feet and Links	No.	7250*DL*	7251*DL*	7252*DL*	7253*DL*	7254*DL*	7255*DL*
12ths " " " "		7250*TL*	7251*TL*	7252*TL*	7253*TL*	7254*TL*	7255*TL*
	each	$ 4 30	4 95	6 85	8 75	9 90	12 15
Length in Meters.			**10**	**15**	**20**	**25**	**30**
Metric (one side only) . . .	No.		7251*M*	7252*M*	7253*M*	7254*M*	7255*M*
	each		$ 4 75	6 65	8 45	10 50	11 85
Metric, other side 12ths of feet	No.		7251*TM*	7252*TM*	7253*TM*	7254*TM*	7255*TM*
	each		$ 5 55	7 90	10 05	12 50	14 30



For Tree Tape No. 7262 P. (circumference and diameter tape) see page 467.

For Patent Thermometer Scale, Etching Tension on Line, Nickelplating Tape Lines, see page 483.

K & E STEEL TAPES.



Please order by number.

Liliput **K & E** Steel Tapes, 1/4 **in. wide,** stout bent leather case, **patent** centre, long swiveling flush folding handle, opened by pushing handle pin from opposite side of case. Nickelplated mountings. Graduations begin **at outside end of ring.**

Length in feet,	25	50
Dimensions,	2¼ × ½ in.	2¾ × ½ in.
Weight,	3½ oz.	5 oz.
10ths of feet	No. 7270*D*	7272*D*
12ths " " (inches in 16ths)	7270*T*	7272*T*
each	$ 3 65	4 45
Length in Meters,	**10**	**15**
Metric (one side only)	No. 7271*M*	7272*M*
each	$ 4 15	4 45
Metric, other side 12ths of feet	No. 7271*TM*	7272*TM*
each	$ 4 95	5 70

The Liliput Steel Tape is warranted to be of the same grade, workmanship and accuracy as the other **K & E** Steel Tapes. It is made very compact and light and is therefore suitable and convenient for the pocket. It is a durable tape and will wear well.



Please order by number.

Rensselaer **K & E** Steel Tapes, 5/16 **in. wide,** Paine's pattern, stout bent leather case, patent centre, long swiveling flush folding handle opened by pushing handle pin from opposite side of case. Two handles for tape line. Nickelplated mountings. Graduations begin **at end of line.**

Length in feet,	50	66	75	100
10ths of feet	No. 7292*D*	7293*D*	7294*D*	7295*D*
12ths " "	7292*T*	7293*T*	7294*T*	7295*T*
each	$ 7 50	9 55	10 80	15 40
Length in Meters,	**15**	**20**	**25**	**30**
Metric (one side only)	No. 7292*M*	7293*M*	7294*M*	7295*M*
each	$ 7 50	9 55	11 80	13 40

The Rensselaer is an extra-fine stout heavy tape.

For Patent Thermometer Scale, Etching Tension on Line, Nickelplating Tape Lines, see page 483

K & E STEEL TAPES.



Please order by number.

Illinois **K & E** Steel Tape, 5/16 **in. wide,** Paine's pattern, stout bent leather case, large centre with long folding handle. Two handles for tape line. Nickelplated mountings. Graduations begin **at end of line.**

Length in feet,	50	66	75	100
10ths of feet	No. 7302 *D*	7303 *D*	7304 *D*	7305 *D*
12ths " "	7302 *T*	7303 *T*	7304 *T*	7305 *T*
each	$ 5 80	7 75	9 25	11 65
Length in Meters,	**15**	**20**	**25**	**30**
Metric (one side only)	No. 7302 *M*	7303 *M*	7304 *M*	7305 *M*
each	$ 5 80	7 75	10 00	11 65



Please order by number.

Princeton **K & E** Steel Tapes, 5/16 **in. wide,** Paine's pattern, strong steel case, large centre with long folding handle. Two handles for tape line. Case and mountings nickelplated. Graduations begin **at end of line.**

Length in feet,	25	33	50	66	75	100
10ths of feet No.	7310 *D*	7311 *D*	7312 *D*	7313 *D*	7314 *D*	7315 *D*
12ths " "	7310 *T*	7311 *T*	7312 *T*	7313 *T*	7314 *T*	7315 *T*
each	$ 3 00	3 85	5 15	6 85	8 55	10 25
Length in Meters,		**10**	**15**	**20**	**25**	**30**
Metric (one side only) No.		7311 *M*	7312 *M*	7313 *M*	7314 *M*	7315 *M*
each		$ 3 85	5 15	6 85	9 35	10 25

For Patent Thermometer Scale, Etching Tension on Line, Nickelplating Tape Lines, see page 483.

K & E STEEL TAPES.



New York **K & E** Steel Tapes, 3/16 in. wide, Paine's pattern, strong steel case, large centre with long folding handle. Two handles for tape line. Case and mountings nickelplated. Graduations begin at end of line.

Please order by number.

Length in feet.	50	100
10ths of feet	No. 7322*D*	7325*D*
	each $ 6 50	11 70

Length in Meters,	15	30
Metric (one side only)	No. 7322*M*	7325*M*
	each $ 6 50	11 70

The New York Tape is an extra-narrow full divided tape, and is of heavy tough steel ribbon, so that it has good wearing qualities. It is intended specially for the use of Surveyors who require a strong tape which offers the least resistance to the wind.

For Nickelplating Tape Lines see page 483.

K & E STEEL TAPES.



HOME K & E Steel Tapes, 3/8 **in. wide**, stout bent leather case, large centre, long folding handle. Nickelplated mountings. Graduations begin **at outside end of ring.**

Please order by number.

Length in feet,	25	33	50	66	75	100
10ths of feet	No. 7350*D*	7351*D*	7352*D*	7353*D*	7354*D*	7355*D*
12ths " "	7350*T*	7351*T*	7352*T*	7353*T*	7354*T*	7355*T*
each	$ 3 20	3 40	3 90	4 85	5 10	6 60

Length in Meters,	10	15	20	25	30
Metric (one side only) . . .	No. 7351*M*	7352*M*	7353*M*	7354*M*	7355*M*
each	$ 3 40	3 90	4 85	5 85	6 60
Metric, other side 12ths of feet	No. 7351*TM*	7352*TM*	7353*TM*	7354*TM*	7355*TM*
each	$ 4 05	4 85	6 15	7 30	8 50

The Home and Armor **K & E** Steel Tapes are intended to supersede the woven tapes which on account of their low price are often used where a more reliable tape ought to be employed. They are of best quality steel and accurately graduated. The neat sewed leather case of the Home Tape is convenient to use and to carry in the pocket.

For Nickelplating Tape Lines, see page 483.

K & E STEEL TAPES.



ARMOR K & E Steel Tapes, 3/8 in. wide, strong steel case, large centre with long folding handle. Case and mountings nickelplated. Graduations begin at outside end of ring.

Please order by number.

Length in feet.	25	33	50	66	75	100
10ths of feet	No. 7370*D*	7371*D*	7372*D*	7373*D*	7374*D*	7375*D*
12ths " "	7370*T*	7371*T*	7372*T*	7373*T*	7374*T*	7375*T*
each	$ 2 70	2 90	3 30	4 15	4 35	5 60

Length in Meters.	10	15	20	25	30
Metric (one side only)	No. 7371*M*	7372*M*	7373*M*	7374*M*	7375*M*
each	$ 2 90	3 30	4 15	5 00	5 60
Metric, other side 12ths of feet	No. 7371*TM*	7372*TM*	7373*TM*	7374*TM*	7375*TM*
each	$ 3 55	4 30	5 40	6 45	7 55

The strong steel case of the Armor tape, a steel tape intended chiefly for Mechanic's use, will wear well even if knocked about or otherwise roughly used. (See also notice on page 494.)

For Nickelplating Tape Lines, see page 483.

K & E STEEL TAPES.

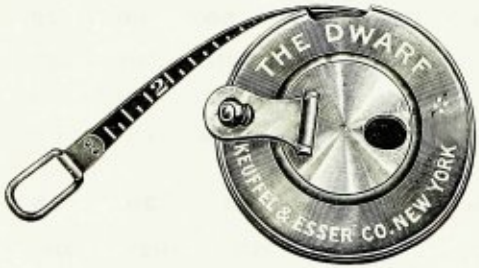


Please order by number.

MIDGET K & E Steel Tapes, ¼ in. wide, stout bent leather case, large centre, long folding handle. Nickelplated mountings. Graduations begin at **outside end of ring.**

Length in feet,	25	50
Dimensions	$2\frac{3}{8} \times \frac{3}{4}$ in.	$2\frac{7}{8} \times \frac{3}{4}$ in.
Weight (about)	$4\frac{1}{4}$ oz.	$6\frac{1}{2}$ oz.
10ths of feet	No. 7360*D*	7362*D*
12ths " " , (inches in 16ths)	7360*T*	7362*T*
each	$ 2 90	3 40

The Midget Steel Tape meets the increasing demand for an accurate and durable steel tape of convenient size for the pocket at a low price. It is similar to the Liliput but has a plain centre, like the Home Tape.



Please order by number.

DWARF K & E Steel Tape, ¼ in. wide, strong steel case, large centre, long folding handle. Case and Mountings nickelplated. Graduations begin at **outside end of ring.**

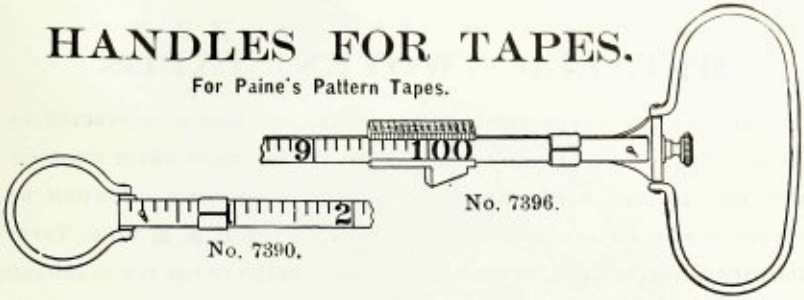
Length in feet,	25	50
Dimensions	$2\frac{1}{4} \times \frac{1}{2}$ in.	$2\frac{3}{4} \times \frac{1}{2}$ in.
Weight (about)	$3\frac{1}{2}$ oz.	6 oz.
10ths of feet	No. 7380*D*	7382*D*
12ths " " , (inches in 16ths)	7380*T*	7382*T*
each	$ 2 40	2 90

The Dwarf Steel Tape is an accurate and durable tape. The case is of steel and will stand much wear and rough usage. It is similar to the Armor tape, but of pocket size.

For Nickelplating Tape Lines, see page 483.

HANDLES FOR TAPES.

For Paine's Pattern Tapes.



No. 7390. No. 7396.

7390.	Plain Brass Handles, ...	each	$	25
7392.	do. do. but large oval ring (as shown in cut of No. 7396)	"		50
7394.	Compensatory Handles for 50 foot tapes $\frac{5}{16}$ in. wide . .	pair	2	00
7396.	do. do. " 100 " " $\frac{5}{16}$ in. wide . .	"	2	00

A pair of Compensatory Handles consists of one compensatory handle as illustrated under No. 7396 and one large plain handle, No. 7392.

In ordering please state for which tapes the handles are wanted.

TENSION HANDLES.

For Engineer's Steel Tapes.

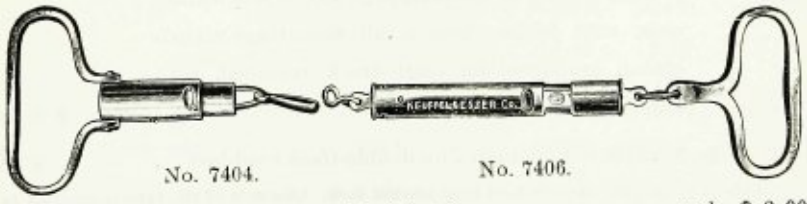
These tension handles form a very valuable addition to a tape, as they enable the user to apply exactly the tension at which the tape is standard. They are recommended also for use with the fine narrow tapes (page 503, etc.)



No. 7400.

7400 Tension Handle, brass, nickelplated, indicating tension up to 10 lbs., reading by half-pounds . . . . . each $ 2 50

7402. Tension Handle like No. 7400, but indicating tension up to 20 lbs., reading by half-pounds . . . . . " 2 50



No. 7404. No. 7406.

7404. Tension Handles, brass, nickelplated . . . . . each $ 2 00

7406. do. do. like No. 7404, but with spirit level . . . " 4 00

Tension Handles No. 7404 and 7406 must be marked for the individual tape, with which they are to be used. They must therefore be ordered WITH THE TAPE.

METALLIC (WOVEN) TAPES.

ALL AND ANY WOVEN TAPES OF ANY MAKE, ARE LIABLE TO STRETCH OR SHRINK. WOVEN TAPES SHOULD THEREFORE NOT BE USED WHEN EXACT MEASUREMENTS ARE REQUIRED, WITHOUT CONSTANT ATTENTION TO THEIR CONDITION BY COMPARISON WITH A STANDARD STEEL TAPE. ANY OF THE **K & E** STEEL TAPES WILL ANSWER THIS PURPOSE, AS THEY ARE MADE ACCORDING TO THE U. S. STANDARD OF THE NATIONAL BUREAU OF STANDARDS AT WASHINGTON.

EXCELSIOR MEASURING TAPES.

WARD'S PATENT ENGINEER'S TAPE.



7410. Excelsior Engineer's Tapes, Ward's Patent, 50 feet, of same quality as No. 7442, (page 500) in bent leather case, with folding handle, all mountings nickel-plated, graduated for single-track road-bed, with Directions . . . . . each $ 3 25

7411. Like No. 7410, but graduated for double-track road-bed . . " 3 25

This is a metallic tape in best bent leather case. One side of the tape is marked in feet and tenths, as for ordinary measurements, while the other side is marked in a special manner for setting Slope Stakes or for finding the centre from the Slope Stakes, after the Centre Stake has been removed.

A pamphlet, **How to Set Slope Stakes**, giving full particulars of the method of using them is supplied with each one of these Tapes.

K & E METALLIC TAPES.



Harvard **K & E** Metallic Tapes, 5/8 in. wide, stout bent leather case, patent centre, long flush folding handle, opened by pushing handle pin from opposite side of case, all mountings nickelplated; line interwoven with metal, leather re-enforced end. Graduations begin **at outside end of ring.**

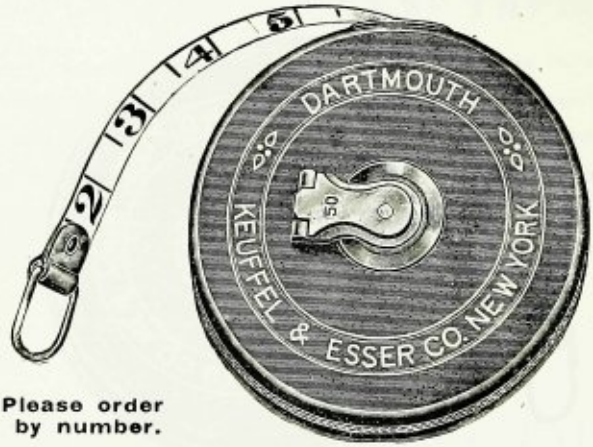
Please order by number.

Length in feet,	25	33	50	66	75	100
10ths of feet	No. 7420*D*	7421*D*	7422*D*	7423*D*	7424*D*	7425*D*
12ths " "	7420*T*	7421*T*	7422*T*	7423*T*	7424*T*	7425*T*
each	$ 1 95	2 25	2 75	3 05	3 35	4 10
10ths of feet and Links,	No. 7420*DL*	7421*DL*	7422*DL*	7423*DL*	7424*DL*	7425*DL*
12ths " " " "	7420*TL*	7421*TL*	7422*TL*	7423*TL*	7424*TL*	7425*TL*
each	$ 2 05	2 35	2 85	3 25	3 50	4 40

Length in Meters.	10	15	20	25	30
Metric (one side only)	No. 7421*M*	7422*M*	7423*M*	7424*M*	7425*M*
each	$ 2 25	2 75	3 05	3 60	4 10
Metric, other side 12ths of feet	No. 7421*TM*	7422*TM*	7423*TM*	7424*TM*	7425*TM*
each	$ 2 35	2 85	3 25	3 80	4 40

For lines (without case) see page 500.

K & E METALLIC TAPES.



Please order by number.

Dartmouth **K & E** Metallic Tapes, 5/8 **in. wide,** stout bent leather case, long folding handle, all mountings nickelplated, line interwoven with metal, leather re-enforced end. Graduations begin **at outside end of ring.**

Length in feet,		25	33	50	66	75	100
10ths of feet	No.	7440 *D*	7441 *D*	7442 *D*	7443 *D*	7444 *D*	7445 *D*
12ths " "		7440 *T*	7441 *T*	7442 *T*	7443 *T*	7444 *T*	7445 *T*
	each $	1 65	1 95	2 45	2 75	3 05	3 80
10ths of feet and Links,	No.	7440 *DL*	7441 *DL*	7442 *DL*	7443 *DL*	7444 *DL*	7445 *DL*
12ths " " " "		7440 *TL*	7441 *TL*	7442 *TL*	7443 *TL*	7444 *TL*	7445 *TL*
	each $	1 75	2 05	2 55	2 95	3 25	4 10

Length in Meters.		10	15	20	25	30
Metric (one side only)	No.	7441 *M*	7442 *M*	7443 *M*	7444 *M*	7445 *M*
	each $	1 95	2 45	2 75	3 35	3 80
12ths of feet and Metric, ...	No.	7441 *TM*	7442 *TM*	7443 *TM*	7444 *TM*	7445 *TM*
	each $	2 05	2 55	2 95	3 55	4 10

K & E METALLIC LINES WITHOUT CASES.

(RE-FILLS.)

Length in feet,		25	33	50	66	75	100
10ths of feet	No.	7460 *D*	7461 *D*	7462 *D*	7463 *D*	7464 *D*	7465 *D*
12ths " "		7460 *T*	7461 *T*	7462 *T*	7463 *T*	7464 *T*	7465 *T*
	each $	80	1 00	1 35	1 55	1 75	2 55
10ths of feet and Links,	No.	7460 *DL*	7461 *DL*	7462 *DL*	7463 *DL*	7464 *DL*	7465 *DL*
12ths " " " "		7460 *TL*	7461 *TL*	7462 *TL*	7463 *TL*	7464 *TL*	7465 *TL*
	each $	90	1 10	1 50	1 75	1 95	2 85

Length in Meters,		10	15	20	25	30
Metric (one side only)	No.	7461 *M*	7462 *M*	7463 *M*	7464 *M*	7465 *M*
	each $	1 00	1 35	1 55	1 95	2 55
12ths of feet and Metric, ...	No.	7461 *TM*	7462 *TM*	7463 *TM*	7464 *TM*	7465 *TM*
	each $	1 05	1 45	1 75	2 15	2 85

K & E METALLIC TAPES.



Please order by number.

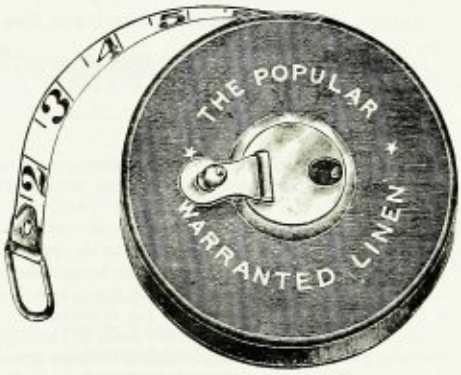
Piccolo **K & E** Metallic Tapes, 3/8 **in. wide,** stout bent leather case, large centre, long folding handle, all mountings nickelplated, line interwoven with metal, end re-enforced with leather.

Length in feet,	25	50
Size and Weight,	$2\frac{3}{4} \times \frac{5}{8}$ in., $4\frac{1}{2}$ oz.	$3\frac{3}{8} \times \frac{5}{8}$ in., $8\frac{1}{2}$ oz.
10ths of feet	No. 7480*D*	7482*D*
12ths " " (inches in eighths)	7480*T*	7482*T*
each	$ 1 55	2 00

Length in Meters,	10	15
Metric (one side only)	No. 7481*M*	7482*M*
each	$ 1 70	2 00

The Piccolo Metallic Tape is warranted to be of the same grade and workmanship as the other **K & E** Metallic Tapes. It differs from them only in size and weight, being very compact and light and therefore suitable and convenient for the pocket. It is a strong tape and will wear well.

THE POPULAR LINEN TAPES.



Please order by number.

THE POPULAR **Linen Tapes,** 5/8 **in. wide,** substantial bent leather case, flat folding handle, all mountings nickelplated. Graduations begin **at end of ring.**

Length in feet,	25	50	75	100
10ths of feet	No. 7510*D*	7512*D*	7514*D*	7516*D*
12ths " "	7510*T*	7512*T*	7514*T*	7516*T*
each	$ 1 20	1 60	2 00	2 40

Length in Meters.	15	25	30
Metric (one side only)	No. 7512*M*	7514*M*	7516*M*
each	$ 1 60	2 20	2 40

The POPULAR is a low-priced well made linen tape in stout bent leather case with durable centre and handle. The line is of the width and finish of our metallic tapes, heavily coated and has a leather re-enforced end.

K & E FINE FLAT STEEL WIRE TAPES

FOR

CITY, MINE, BRIDGE AND RAILROAD ENGINEERING.

CITY ENGINEERS' STANDARD TAPE.

(Not Sub-Divided.)



No. 7600.

7600.	City Engineer's Standard Tape, $\frac{3}{8}$ in. wide, 50 ft., with improved spring balance adjustable for temperature, with level and thermometer, two nickelplated handles on folding brass reel No. 7650 B . . . . . each	$ 18 00
7601.	City Engineer's Standard Tape, like No. 7600, but 100 ft. . "	21 00
7605.	do. do. do. like No. 7600, but 25 meters "	21 00

The spring balance consists of two telescoping brass tubes connected by a strong spring; the inner tube carries the spirit level and tension mark, and the outer one carries the thermometer which is protected by a revolving semi-tubular cover. A knurled clamping ring encircles the outer tube; in it is cut a V-shape groove representing the end mark of the measure. The spring balance up to the groove in the ring is INCLUDED IN THE MEASURE. On the outer tube is engraved the temperature scale, which compensates expansion and contraction and is marked with the corresponding degrees Fahrenheit. Correction for temperature, *i. e.* allowance for contraction and expansion is made by adjusting the clamping ring on the temperature scale to the degree indicated by the thermometer. The starting point is marked by another V-shape groove in a brass plate at the other end of the tape. There are no intermediate graduations on this tape, and the tension and temperature corrections apply to its entire length only.

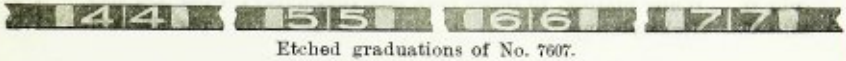
DIRECTIONS.

To use this tape, adjust the clamping ring according to the temperature as read on the thermometer then bring the V-shape zero groove in the brass lug at the other end of the line exactly over the starting point by means of a suspended plumb-bob; pull the telescoping handle until the tension marks coincide, and bring the tape into a horizontal plane by means of the spirit level. A second plumb-bob suspended from the V-shape groove on the spring balance will then indicate the terminal point on the ground.

K & E FLAT WIRE TAPES, GRADUATED.

These tapes are made of the best and toughest flexible steel-ribbon, carefully tempered to prevent breaking or kinking. They are graduated according to the standard of the National Bureau of Standards and are correct at 62° Fahrenheit.

FLAT WIRE TAPES WITH ETCHED GRADUATIONS.



Etched graduations of No. 7607.

7607. Flat Wire Tapes, $\frac{1}{2}$ in. wide, graduated at every foot, end-foot to 10ths. The graduations are **etched** in a new manner, which insures their durability in rough work (for reels see page 505). They can be furnished in any length up to 500 feet; 2 nickelplated detachable handles. 100 feet . . . . . $ 4 00

Each additional 100 feet 3 50

Graduated throughout, feet to 100ths:

The following tapes can be made in any **length up to 1000 feet,** without joints. We furnish, if so ordered, a certificate giving the temperature and the tension at which the tape agrees with our standard (a fac-simile of the standard of the National Bureau of Standards) when the tape is supported over its entire length and when it is suspended from its ends. The charge for a certificate of comparison will be according to the conditions of the test. (See also page 482.)

7608. Flat Wire Tapes, $\frac{1}{2}$ in. wide, **etched** to 10ths and 100ths ft., black line, bright numbers and graduations, 2 nickelplated detachable handles (for reels see page 505). 100 feet . . . . $ 7 50

Each additional 100 ft., same graduation 6 50

7609. Like No. 7608, but nickelplated 9 25

Each additional 100 ft., same graduation 8 25

FLAT WIRE TAPES GRADUATED ON CLAMPED SLEEVES.



Graduations on sleeves.

Our Fine Flat Wire Steel Tapes with brass sleeves are of the most improved device. The sleeves are firmly clamped (or clamped and soldered) and are notched exactly opposite the graduation for the exact locating of the plumb-bob line. The ends of the sleeves are beveled to prevent their catching on obstructions when measuring, or on each other when winding or unwinding the tape.

7610. Flat Wire Tapes, $\frac{1}{2}$ in. wide, black line, graduated on **clamped brass sleeves,** 2 nickelplated detachable handles, (for reels see page 505.) Graduated every foot, 100 feet . . . . . $ 7 00

Each additional 100 ft., same graduation 6 00

7610 B. Graduated every 3 feet, 99 feet 6 00

Each additional 99 feet, same graduation 5 00

7610 D. Graduated every 5 feet, 100 feet 5 00

Each additional 100 feet, same graduation. 4 00

7610 F. Graduated every 10 feet, 100 feet 3 00

Each additional 100 feet, same graduation. 2 00

7610 H. Graduated every 25 feet, 100 feet 2 50

Each additional 100 feet, same graduation 1 50

Reels are listed separately (see page 505,) and are not included in the price of these tapes.

For other Flat Wire Tapes see next page.

Fine flat wire tapes graduated in Links, Vara, or other measure furnished to order at short notice.

7610 K.	First 3 ft. graduated on brass sleeves to single feet	$ 50
7610 M.	" 5 " " " " " " " "	75
7610 O.	" 10 " " " " " " " "	1 00
7610 R.	" 25 " " " " " " five "	1 00
7610 T.	" foot graduated on brass sleeves to 10ths of feet	1 00
7610 V.	" foot etched to 10ths and 100ths feet	50
7610 W.	White plating, to resist rust, (see foot note) . . per 100 feet	1 50
7610 Y.	Nickelplating, ... per 100 feet	1 75

FLAT WIRE TAPES METRIC; CLAMPED SLEEVES.

7612.	Flat Wire Tapes, (Metric) $\frac{1}{8}$ in. wide, black lines, graduated on **clamped brass sleeves,** 2 nickelplated detachable handles, (for reels see page 505), graduated every 20 cm., 25 meters . . .	$ 8 00
	Each additional 25 meters	7 00
7612 C.	Graduated every half-meter, 25 meters	7 00
	Each additional 25 meters	6 00
7612 E.	Graduated every meter, 25 meters	6 00
	Each additional 25 meters	5 00
7612 G.	First half-meter graduated on brass sleeves to decimeters . .	75
7612 I.	" meter graduated on brass sleeves to decimeters	1 00
7612 L.	" decimeter etched to millimeters	50
7612 N.	White plating, to resist rust, (see foot note) . per 25 meters	1 50
7612 P.	Nickelplating, ... per 25 meters	1 75

FLAT WIRE TAPES GRADUATED ON SOLDERED SLEEVES.

7613	Flat Wire Tapes, $\frac{1}{8}$ in. wide, graduated on **tubular brass sleeves carefully soldered** to the tape to prevent corroding from moisture entering between sleeves and tape line, **heavily plated with white metal** (to resist rust), 2 nickelplated detachable handles, graduated every foot, 100 feet	$ 14 00
	Each additional 100 ft., same graduation	13 00
7613 B.	Graduated every 3 feet, 99 feet	12 00
	Each additional 99 ft., same graduation	11 00
7613 D.	Graduated every 5 feet, 100 feet	10 00
	Each additional 100 ft., same graduation	9 00
7613 F.	Graduated every 10 feet, 100 feet	6 00
	Each additional 100 ft., same graduation	5 00
7613 H.	Graduated every 25 feet, 100 feet	5 00
	Each additional 100 ft., same graduation	4 00
7613 K.	First 3 feet graduated on soldered sleeves to single feet . .	75
7613 M.	" 5 " " " " " " " " . .	1 00
7613 O.	" 10 " " " " " " " " . .	1 75
7613 R.	" 25 " " " " " " five " . .	1 75
7613 T.	" foot " " " " " " tenths " . .	1 75

Etched tapes (or tapes with etched end-units) can be furnished nickelplated but they cannot be furnished plated with white metal. Tapes plated with white metal cannot be furnished with end-units etched.

For price list of Reels see page 505.

7614. Flat Wire Tapes, (Metric) $\frac{1}{8}$ in. wide, graduated on **tubular brass sleeves, carefully soldered** to the tape to prevent corrosion from moisture entering between sleeves and tape, **heavily plated with white metal** (to resist rust), 2 nickelplated detachable handles, graduated every 20 centimeters. 25 meters $16 00
Each additional 25 meters 15 00
7614 C. Graduated every half-meter, 25 meters 14 00
Each additional 25 meters 13 00
7614 E. Graduated every meter, 25 meters 12 00
Each additional 25 meters 11 00
7614 S. First decimeter graduated on soldered sleeves to centimeters 1 75
7614 I. " half meter graduated on soldered sleeves to decimeters 1 75
7614 L. " meter, graduated on soldered sleeves to decimeters . . . 1 75

7649. Clamping handle, for narrow tapes, brass, nickelplated, to attach to any part of tape . . . . . each $ 75

No. 7649



REELS FOR FLAT WIRE TAPES.

The reels here described embody all the latest improvements, the result of years of experience and study.

Any of the Steel Tapes listed under Nos. 7608 to 7614 can be furnished on the Reels here listed, with such limitations as to length as we state in the descriptions of the reels.

The prices of Flat Wire Tapes are for the tape lines only: the price of the reel is extra.

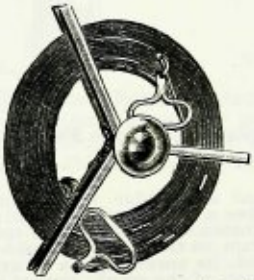


7650 A.



7650 A. Folded.

7650 A. Folding Reel, hardwood, plain, nickelplated brass trimmings, for tapes 100 to 500 ft. long . . . . . each $ 1 25



No. 7650 B.



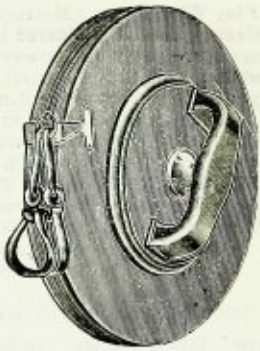
7650 B. Folded.

7650 B. Folding Reel, brass, nickelplated, hardwood knob, for tapes 100 to 200 ft. long . . . . . each $ 4 00

Please note that these prices are for REELS ONLY. The Lines shown on some of the cuts of the reels are for better illustration.



No. 7650 C.



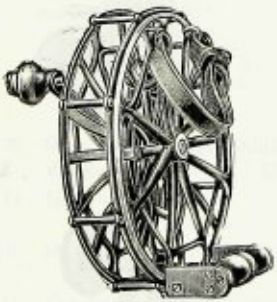
7650 D.

7650 C. Reel of polished, built-up hardwood, very substantial, revolving on metal centre, nickelplated brass bolts and two hardwood knobs, for tapes from 100 to 500 ft. . . . . each $ 7 00

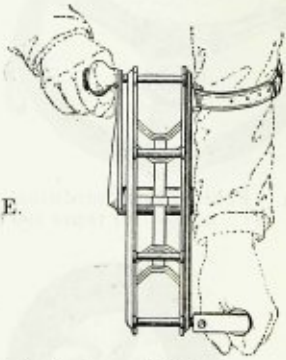
The opening in reel C enables the chainman to slip the reel over his arm, where it will not impede him when manipulating the tape.

7650 D. Reel of built-up hardwood, improved, polished, revolving on large brass centre, large wooden grip and one hardwood knob, for tapes from 100 to 500 ft. long . . . . . each $ 10 00

Reel D is very strong and substantial, of light weight and easily manipulated.



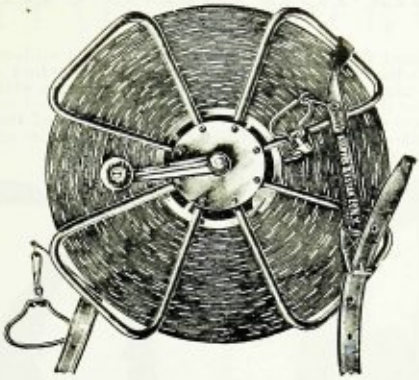
No. 7650 E.



7650 E. Skeleton Reel, gun metal, nickelplated, for tapes 300 to 500 ft. . . . . each $ 13 50

Reel E is especially adapted for railroad and bridge work, being exceedingly strong, to withstand very rough usage. It has a strong grip handle and a leather strap fitting around the fore-arm of the chainman, thus distributing the weight over the whole arm and greatly reducing the strain on the wrist. Should less than the full length of the tape on the reel be required, its unreeling can be arrested at any desired point by a brake in the wooden knob of the crank, applied by a half-turn of the milled head.

Please note that these prices are for REELS ONLY. The lines shown on some of the cuts of the reels are for better illustration.



No. 7650 H.

7650 H. K & E Improved Metal Reel, with strong shoulder strap, for lines from 300 to 500 feet . . . . . each $ 12 00

Reel H is a heavy metal skeleton reel with large centre and extra-long handle with large knob. It is very strongly and substantially built. The eight metal arms are so arranged that they preclude kinking of the line during winding and leave the wound line freely exposed to the air for rapid drying and cleaning.

K & E MINE REEL.

PATENTED





No. 7650 M.

7650 M. K & E Mine Reel, aluminum, 19 in., brass centre, automatic mechanism for spooling the line evenly on the reel, weight of reel about 5½ lbs. . . . . each, $25 00

In ordering this reel, please describe the tape for which it is wanted and state its length.

The K & E Mine Reel, the best ever devised for long narrow tapes, is of aluminum, except the axis and wearing parts which are of hard brass. The frame is a stout ribbed T bar with breast plate, 19 in. over all.

When winding the line the mouth-piece on the reel travels automatically from side to side across the groove on the reel, so that the line is evenly spooled and cannot tangle nor catch. A double spring-brake prevents the line springing out into loose loops while reeling it. A lever brake at the handle can be applied to act as a drag on the reel. The mouth-piece for the line is provided with rollers.

Please note that these prices are for REELS ONLY. The lines shown on some of the cuts of the reels are for better illustration.

EXCELSIOR BAND CHAINS.

(Patented.)

The Excelsior Band Chains are of heavy blued steel ribbon ⅛ in. wide, (except No. 7668.) They are graduated and marked by rivets at every foot or link and numbered at every 5 feet or 5 links on brass plates riveted to the tape with additional number marks at every 10 feet or links. The number plates have rounded edges so that they will not catch, and they are notched to insure correct locating of the plumbing cord. A wooden folding reel like No. 7650-A, and two detachable handles are furnished with the band chain and are included in the price.

No. 7660 C.



"Copyright, 1899, by Keuffel & Esser Co."

7668.





Graduations of Patent Excelsior Band Chains No. 7660 to 7663.

7660 Excelsior Band Chains, ¼ in. wide,

			50	feet,	grad.	every	foot,	end-foot	to	10ths,	each	$ 4 00
7660 B.	do.	do.	100	"	"	"	"	"	"	"	"	5 00
7660 C.	do.	do.	200	"	"	"	"	"	"	"	"	7 50
7660 D.	do.	do.	300	"	"	"	"	"	"	"	"	10 00
7661 C.	do.	do.	200	"	"	"	5 feet,	"	"	"	"	6 00
7661 D.	do.	do.	300	"	"	"	"	"	"	"	"	10 00
7662	do.	do.	50	"	"	"	foot,	"	"	12ths	"	4 00
7662 B.	do.	do.	100	"	"	"	"	"	"	"	"	5 00
7662 C.	do.	do.	200	"	"	"	"	"	"	"	"	7 50
7663 C.	do.	do.	200	"	"	"	5 feet,	"	"	"	"	6 00
7663 L.	do.	do.	66	"	"	"	link	(100 links)			"	5 00

EXCELSIOR RAILROAD BAND CHAIN.



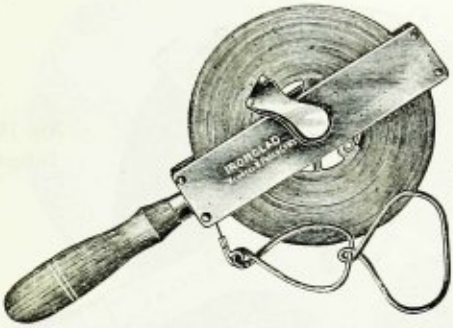
Graduations of Excelsior Band Chains No. 7668.

7668. Excelsior Band Chain, **EXTRA HEAVY,** for Railroad work, etc., ¼ in. wide, 100 feet, graduated every foot **on brass sleeves,** first foot to tenths, very thick steel band, two swiveling chain handles attached by strong spring hooks and solid rings; best quality and workmanship throughout; reel similar to Style 7650 A; a correct and very substantial Band Chain for rough work, each $ 10 00

For lines (without reels) see page 511.

For Nickelplating Lines see page 509.

IRONCLAD BAND CHAINS.



No. 7664 C.



Graduations of Ironclad Band Chains No. 7664.

IRONCLAD Band Chains, heavy black steel ribbon, ¼ inch wide, **etched** graduations at every foot, end-feet to 10ths and 100ths. The graduations are etched in a manner which insures permanence in rough work. Reel and all mountings nickelplated, two large handles for the line.

7664 B.	**IRONCLAD** Band Chain,	¼	in.	wide,	etched	graduations,	100 ft. each	$ 5 75
7664 C.	do.	do.	do.	¼	"	"	do.	200 ft. "	8 75



Graduations of Ironclad Band Chains No. 7666.

IRONCLAD BAND CHAINS heavy steel ribbon, ¼ in. wide, plated with white metal (to resist rust) and graduated and numbered at every foot on Babbitt metal. Reel and all mountings nickelplated, two large handles for the line.

7666 B.	**IRONCLAD** Band Chain,	¼	in.	wide,	graduated	on Babbitt metal,	100 ft. each	$ 5 75
7666 C.	do.	do.	do.	¼	"	"	do.	200 ft. "	8 75

IRONCLAD BAND CHAINS are of most substantial construction and very accurate. The line is of heavy steel ribbon ¼ inch wide. The very practical reel consists of two strong steel plates, 1½ inches wide, carrying a large centre (for quick and easy winding) with extra-long heavy folding brass handle. The width of the side plates prevents tangling of the line in reeling or unreeling. All metal parts of the reel are heavily nickle-plated. The line, when reeled up, is exposed to the air, so that it will dry readily and free itself of adhering soil or dirt. Two large nickleplated handles for the line are furnished with each chain.

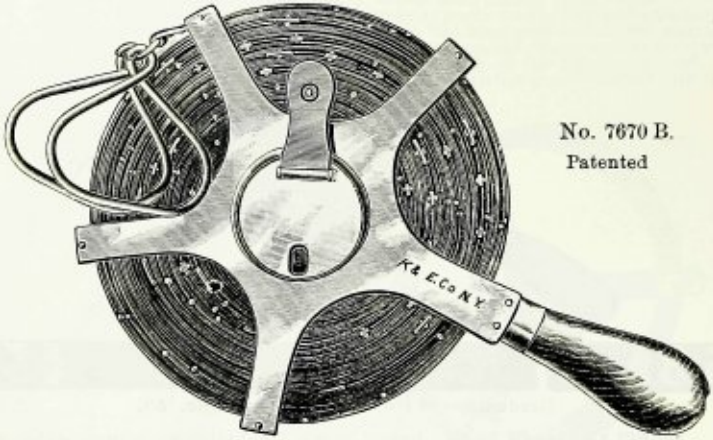
We recommend the **IRONCLAD BAND CHAINS** for their durability; they are practically indestructible.

NICKELPLATING BAND CHAINS.

We are prepared to furnish our band chains nickelplated in the best and most durable manner (for protection against rust) at the following extra charge:

Length in feet.	50	66	100	200	300
extra, each	$ 1 50	1 50	2 00	3 00	4 00

CHAMPION BAND CHAINS



No. 7670 B.
Patented

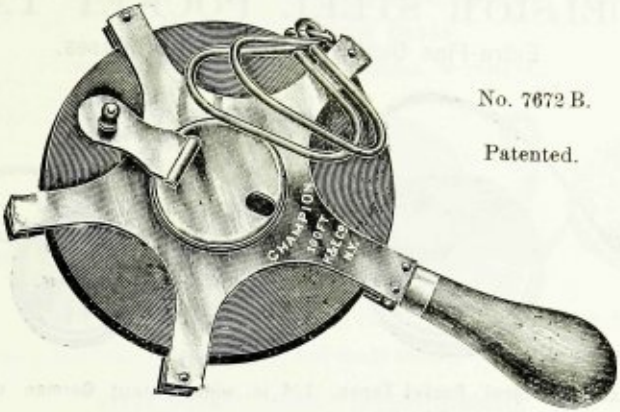
Champion Band Chains are of superior quality heavy steel ribbon, ⅜ in. wide. Nos. 7670 and 7671 are graduated and marked by rivets at every foot or link, the two end-feet are subdivided to 10ths. They are numbered at every 5 feet with additional number marks at every 10 feet. The number plates have rounded edges so that they will not catch, and they are notched to insure correct locating of the plumbing cord. The reel is of stout metal, nickelplated with polished wooden handle, two nickelplated handles for the line. The 100-foot band chain, complete, weighs about 2 pounds and measures about 6¾ inches across. The "Champion" is a substantial and reliable band chain of light weight, strong enough for rough work and easy to wind and unwind. As the whole tape is exposed to the air while on the reel, it is easily dried and kept clean.



GRADUATIONS OF CHAMPION BAND CHAINS Nos. 7670-7671.

7670 B.	Champion Band Chain, ¼ in. wide, superior quality, **heavy blued steel ribbon,** ¼ in. wide,				100 feet	each	$ 6 75
7670 C.	do.	do.	do.	do.	200 "	"	10 25
7670 D.	do.	do.	do.	do.	300 "	"	14 50
7670 L.	do.	do.	do.	do.	66 " (100 links)	"	6 75
7670 B.M.	Champion Band Chain, like No. 7670, but 25 Meters					"	6 75
7670 C.M.	do.	do.	"	"	7670, but 50 "	"	10 00
7671 B.	Champion Band Chain, like No. 7670, but **plated with white metal,** to resist rust,				100 feet	each	$ 6 75
7671 C.	do.	do.	do.	do.	200 "	"	10 25
7671 D.	do.	do.	do.	do.	300 "	"	14 50
7671 L.	do.	do.	do.	do.	66 " (100 links)	"	6 75
7671 B.M.	Champion Band Chain, like No. 7671 but 25 Meters,					"	6 75
7671 C.M.	do.	do.	"	"	7671 " 50 "	"	10 00

For nickelplating lines see page 509.



No. 7672 B.

Patented.

Champion Band Chains No. 7672 are like No. 7670 but with etched graduations at every foot or link, end-feet to $\frac{1}{10}$ths and $\frac{1}{100}$ths. The graduations are etched in a new manner, which insures their durability also in rough work.



Graduations of 7672.

7672 B.	Champion Band Chain, $\frac{1}{4}$ in. wide etched,			100 feet . . . each	$ 6 75
7672 C.	do.	do.	do.	200 " . . . "	10 25
7672 D.	do.	do.	do.	300 " . . . "	14 50
7672 L.	do.	do.	do.	66 "(100 links) "	6 75



Graduations of No. 7674.

Champion Band Chains, No. 7674, are plated with white metal (to resist rust) and are graduated and numbered at every foot on Babbitt Metal. They are well adapted for use in mines, as no water or moisture can enter between the Babbitt metal and band to corrode the tape. On rough ground like stone or gravel, the graduations are less liable to injury than rivets or plates.

7674 B.	Champion Band Chain, $\frac{1}{4}$ in. wide graduated on Babbitt metel,				100 feet . . . each	$ 6 75
7674 C.	do.	do.	do.	do.	200 " . . . "	10 25
7674 D.	do.	do.	do.	do.	300 " . . . "	14 50
7674 B.M.	Champion Band Chain, like No. 7674B, but				25 Meters, "	6 75
7674 C.M.	do.	do.	do.	do.	" 50 " "	10 00

LINES FOR BAND CHAINS

(Without Reels.)

Line ¼ in. wide, for Champion or Ironclad Band Chains, graduated by rivets, etched, or on Babbitt metal.

66	100	200	300 feet	25	50 meters
$8 90	3 90	6 80	10 25	3 90	6 50

In ordering lines only, please state for which catalogue number of Band Chain.

EXCELSIOR STEEL POCKET TAPES.

Extra-Fine Quality, German Silver Cases.

Patented.



Excelsior Steel Pocket Tapes, 1/4 in. wide, patent **German silver case,** spring winding, with stop.

Length in feet,	3	5	6	9	12
Inches to 16ths . . . . . No.	7690 *T*	7691 *T*	7692 *T*	7693 *T*	7694 *T*
each	$ 1 00	1 25	1 40	1 90	2 50
Feet to 100ths . . . . . No.	7690 *D*	7691 *D*	7692 *D*	7693 *D*	7694 *D*
each	$ 1 00	1 25	1 40	1 90	2 50
Inches to 16ths and metric . . No.	7690 *TM*	7691 *TM*	7692 *TM*	7693 *TM*	7694 *TM*
each	$ 1 10	1 40	1 60	2 20	2 80

7705. Excelsior Steel Pocket Tape, 1/4 **in. wide,** 10 feet, divided 10ths of feet, other side links, patent **German silver case,** spring winding, with stop . . . . . each $ 3 00



Excelsior Miniature Steel Pocket Tapes, 5/32 in. wide, patent **German silver case,** 1 in. diameter, spring winding, with stop, **36 in.**

7707. Inches in 16ths . . . . . each $ 1 00
7708. " " " other side Millimeters . . . . . " 1 10

Tapes 7690T. and TM., 7691T. and TM., 7692T. and TM. are **numbered** inches only, the others are numbered feet and inches, or feet and 10ths, except the Metric at every cm.

NICKELPLATING POCKET TAPE LINES.

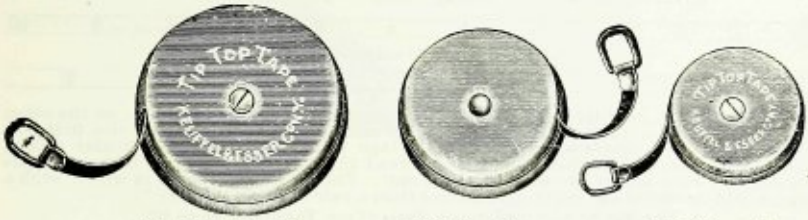
We are prepared to furnish our pocket tape lines nickelplated in the best and most substantial manner (for protection against rust) at the following extra charge:

Length in feet,	3	5	6	9	12
extra each	$ 25	30	35	40	45

TIP TOP TAPES.

Nickelplated Brass Cases.

STEEL POCKET TAPES, SPRING WINDING.



No. 7713 (front) 7711 (back) 7720 (front)

We recommend the Tip Top Tapes as well made reliable tapes at a moderate price.

STEEL POCKET TAPES. SPRING WINDING.

TIP TOP Steel Pocket Tapes, ¼-in. wide, **nickelplated** brass case spring winding, with centre push-pin, and stop.

Length in inches,	36	60	72	96
Inches to 16ths (one side) . . . No.	7710*T*	7711*T*	7712*T*	7713*T*
each	$ 55	70	80	1 10

No. 7713*TF*

Feet to inches in 16ths (one side) . . . . . **8** feet each, $ 1 10

Length in feet.	3	5	6	8
Feet to 100ths (one side) . . . No.	7710*D*	7711*D*	7712*D*	7713*D*
each	$ 55	70	80	1 10

Length in Metres,	1	1½	2	2½
Inches to 16ths and Metric (both sides) No.	7710*TM*	7711*TM*	7712*TM*	7713*TM*
each	$ 65	80	1 00	1 30

LINEN POCKET TAPES. SPRING WINDING.

TIP TOP Linen Pocket Tapes, ¼-in. wide, **nickelplated** brass case, spring winding, with centre push-pin, and stop.

Length in inches,	36	60	72	96
Inches to 16ths (one side) . . . No.	7720*T*	7721*T*	7722*T*	7723*T*
each	$ 30	35	40	60

No. 7723*TF*

Feet to inches in 16ths (one side) . . . . . **8** feet each, $ 70

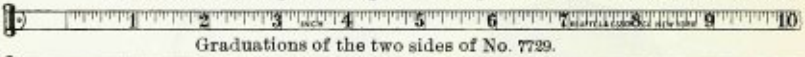
(THE LENGTH OF THESE TAPES IS MARKED ON THE LINE, BEFORE THE FIRST INCH.)

For nickelplating Lines see page 512.

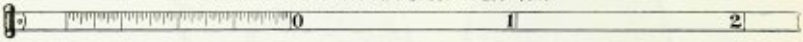
K & E STEEL TAPES

FOR READING DIAMETER OPPOSITE CIRCUMFERENCE (π TAPES.)

7729. **K & E** Steel Pocket Tape, 1/4 **in. wide,** patent German silver case, spring winding, with stop, 12 feet . . . . each $ 3 25



Graduations of the two sides of No. 7729.



This tape is graduated on one side in inches and sixteenths of inches; on the other side spaces equal to 3.1416 inches are marked off and numbered 0, 1, 2, etc., the first one being subdivided into 64 equal parts. If the tape is passed around a circular object, say a column, the "circumference" side will read the correct number of inches and the fraction (to 64ths in.) of the **diameter.** (see cut). There are many cases in which such a tape would be useful and certainly handier than a pair of large calipers.

For 50-foot Circumference Tape (Tree Tape) see page 467.

K & E MECHANIC'S STEEL TAPES.



K & E New Mechanic's Steel Tapes, 3/8 **in. wide,** nickelplated metal case, large centre with long folding handle, graduations begin **on the line.**

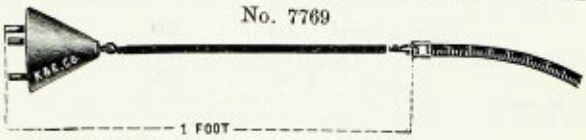
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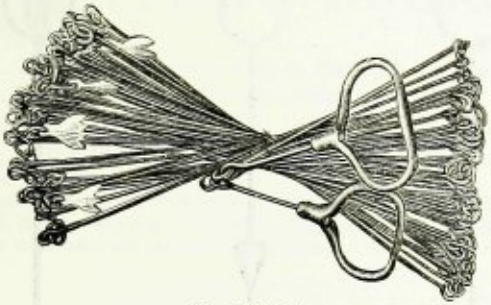
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